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CONTENTS

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

The Problem of Railway Charges

IN his paper under the above heading recently read before the Institute of Transport, which is summarised in our News Section, Mr. W. V. Wood, a Vice-President of the L.M.S.R., has made a most valuable contribution to the study of this important subject. He shows that, since 1894 at any rate, the principal effect of State control of railway charges has been to curtail the profits which the legislature intended the railways to enjoy. In 1891 and 1892, for instance, the Board of Trade framed a balanced scale of maximum charges which was intended to give them more in some cases and less in others than their previous powers had granted. But an outcry from the traders who were charged more led to the passing of an Act in 1894, which in practice made the effective maximum, when a rate was not reduced by the new scale, the rate which happened to be on the books at December 31, 1892. Some relaxation was introduced by an Act of 1913. The Railways Act of 1921 abolished maximum charges and substituted fixed standards, which could be modified by the granting of "exceptional" rates, and these were intended to give the railways a standard revenue, which has never been attained. While these standard charges were in process of being fixed, road competition had come in with charges framed at the unrestricted will of the operators which cut the rates on high priced traffics and upset the balance aimed at by the scheme of railway charges. Road operators, moreover, were not, and are not, compelled to carry the less profitable consignments. Mr. Wood takes the view that all public services which by their nature are monopolistic must, to safeguard the national interest, come under some control in regard to their charges, profits, and services, but that there is no justification for such control being applied to one form of transport only.

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Cinemas on Trains

Not only in this country but also in the U.S.A., the mobile cinema theatre is becoming accepted as an adjunct to railway travel. As we recorded last week, experiments with several types of apparatus are being conducted in the U.S.A. by the Pullman interests, with a view to installing motion pictures in club and observation cars. This follows the experience of the past year with the cinemas which have been a feature on the *de luxe* trains of one or two southern U.S.A. lines, notably those taking holiday-makers to Florida coast resorts. In Great Britain the experiments are for the time being confined to the L.N.E.R., which, in May of last year, collaborated with Pathé Equipment Limited in introducing the first British railway cinema. Then, it will be remembered, a van specially equipped for film projection was attached to the 10.10 a.m. train from King's Cross to Leeds and the 3.15 p.m. train in the reverse direction. Encouraged by the success of this venture, the L.N.E.R. on March 2 last introduced a second cinema car—this time on the Leeds-Edinburgh run. The interior of the new coach is illustrated and briefly described on page 744.

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The Week's Traffics

As the latest traffic returns of the four group companies are for Good Friday week and compare with those for an ordinary week in 1935, there is naturally a big increase in their passenger train receipts, with decreases, though much smaller, in merchandise and coal. Passenger train earnings for the past week on the L.M.S.R. amounted to £671,000, an increase of £30,000 in comparison with Good Friday week 1935; on the L.N.E.R. to £392,000, an increase of £9,000; on the Great Western to £267,000, an increase of £5,000; and on the Southern to £389,000, an increase of £10,000. Merchandise receipts show the following changes in comparison with the Good Friday week of 1935:—L.M.S.R. + £15,000, L.N.E.R. + £17,000, G.W.R. + £6,000, and Southern + £500. Figures in the accompanying table compare with an ordinary week in 1935:—

	15th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 248,000	− 57,000	− 32,000	+ 159,000	+ 665,000	+ 4·07
L.N.E.R. ..	+ 108,000	− 33,000	− 46,000	+ 29,000	+ 416,000	+ 3·44
G.W.R. ..	+ 87,000	− 18,000	− 6,000	+ 63,000	+ 230,000	+ 3·45
S.R.	+ 119,000	− 12,000	− 4,000	+ 103,000	+ 198,000	+ 3·97

London Transport receipts for the past week show a decrease of £17,600, but for the 41 weeks to date there is an increase of £404,300.

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First Class Travel on London Transport Trains

The recent announcement that on and from May 4 first class accommodation on the Hammersmith and City Line, the East London Line, and the Addison Road branch will be abolished, marks an important further step in the simplification of local facilities. Holders of first class season tickets expiring after that date will be refunded the difference

between the first and third class rate on the unexpired portion. It will be recalled that second class disappeared on the District and Metropolitan with electrification and that the tube lines have always had one class only, with the exception of the Northern City Line which abandoned first class on March 25, 1934. At the present time, and for many years past, the issue of first class tickets has been suspended at stations east of Mansion House on the District line between 7.0 a.m. and 10.0 a.m. and between 5.0 p.m. and 7.0 p.m. on weekdays and between 12.0 noon and 2.0 p.m. on Saturdays; during those times all accommodation is available to third class passengers on District Line trains working east of Mansion House station. Partly in view of the fact that Hammersmith and City Line trains will work over the same line as these District trains between St. Mary's and Barking, and also that, while the London Passenger Transport Board provides first class accommodation amounting to 17 per cent. of the total on this line and only 0·5 per cent. of the passengers take advantage of it, the decision to abolish first class altogether on certain sections has been taken.

* * * *

Chief Executive Officers in India and Elsewhere

It is noteworthy that in the appointment of Agents—the equivalents of General Managers elsewhere—the Indian Railway Board has recently maintained a policy of selection, men of outstanding ability being preferred to others more senior. This policy has much to recommend it, especially in that it makes for longer continuity of tenure of the highest executive appointment on each system, in a country where 55 is the age of compulsory retirement. In appointing the members of the Pope Economy Committee also, the selection of promising younger men was significant, and, as it turns out, two of those members have already been selected as Agents of the two largest railways, Mr. J. A. Bell of the East Indian last autumn, and now Lt.-Col. C. F. Carson of the North Western, as recorded in our personal columns this week. Incidentally, this latter appointment should be gratifying to Canadians, in that one of them has been selected to control the destinies of a third great system, which, adding another 7,000 route miles to the 45,000 of the C.N.R. and C.P.R. lines, brings the total length of line for which three Canadians are primarily responsible to about 52,000 miles.

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Flood Damage in Pennsylvania

Five hundred miles of the Pennsylvania Railroad system were inundated to a depth sufficient to stop traffic during the floods of March 17 to March 21 in the north-eastern United States. The main line between Harrisburg and Pittsburgh was the most seriously affected, through services being suspended from 6.30 p.m. on March 17 to 12.1 p.m. on March 21. Among the well-known trains which were cancelled was the Broadway Limited, which did not run for four days. The Manhattan Limited was actually *en route* on March 17 when it was caught by the worst of the flood and had to be diverted over the lines of four other companies. After travelling over 400 miles out of its way, it arrived in New York on March 19, some 35 hr. late. Seven thousand Pennsylvania freight cars, 110 passenger cars, and 97 locomotives sustained varying degrees of damage in the floods, while 2,500 poles carrying telegraph and power lines were destroyed and 11,000 more required repairs. Severe trouble was also experienced on the Baltimore and Ohio, beginning with washaways on the Chicago and St. Louis lines on March 17; through running was maintained by deviations (subject to frequent changes) over other railways, and normal facilities from Pittsburgh to Chicago and St. Louis were restored on March 19. The total cost of repairs to railway flood damage in Pennsylvania is estimated at some $7 million.

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The French Railways Facing the Crisis

A booklet with the above title has just appeared in France, its object being to bring to the public notice both the factors which are contributing to the annual series of railway deficits, and the measures taken by the companies in their efforts to regain financial equilibrium. Apart from influences beyond the control of the railways, such as the world slump and the growth of road competition, the chief obstacle to the railways in their struggle is held to be the refusal of the State in 1929 and 1930 to implement its promise of a revision of railway charges, while at the same time imposing the payment of higher wages on four different occasions. Promised co-ordination with road transport is also being delayed, and although it was to have been achieved by the end of the present year, it is not now expected before 1938 or 1939. Even then, the estimated annual revenue from the co-ordinated services of fr. 7 to 8 million is not expected to materialise unless the interests at present nullifying the benefits of such programmes as are already under way are held in check. It has been stated by M. Henry Roy, Minister of Public Works in 1935, that unregulated competition by the roads in goods transport alone is costing the railways fr. 2 milliards annually, or half their present deficit. For the rest, the booklet is a summary of railway enterprise in the face of these and other vicissitudes.

* * * *

Jubilee of Vancouver—A Railway-made City

The City of Vancouver officially celebrates its jubilee on July 1 (Dominion Day) but actually, the city was incorporated on April 6, 1886. Two months later, however, it was wiped out by fire, so that the national birthday approximately synchronises with the birth of the new city that arose. Sixty years ago this commercial metropolis of the Province of British Columbia, the third largest city in the Dominion of Canada, had no existence, even in name. Its site is a peninsula, " a very narrow border of low land " as Captain George Vancouver described it, when he navigated Burrard Inlet on June 13, 1792. Settlement of the site began in 1862 and the names Granville and Gastown were applied locally. Neither fell pleasantly on the ears of Mr. William C. Van Horne, when, as Vice-President and General Manager of the Canadian Pacific Railway syndicate, he went to the coast in July, 1884, to acquire lands for railway purposes. He suggested " Vancouver " as the name of the transcontinental terminal, and this it has remained. The coming of the railway, which linked up the Province with the rest of Canada, was the main factor in the making of Vancouver. On May 23, 1887, the first passenger train from the east pulled into the city, and the effect of it was immediate. Docks for ocean-going steamers sprang into existence, thirty-six miles of streets were graded, and an electric lighting system and a telephone service introduced. In 1886, when it received incorporation as a city, Vancouver had a population of 2,000 and by the end of 1891 the figure had risen to 10,000. In the latter year the Canadian Pacific Railway with its fleet of " Empress " steamships inaugurated its trans-Pacific service and thereby brought Vancouver its first prominence as a seaport. Today Vancouver has a population of 300,000, and the photographs we reproduce on pages 748-9

show graphically the enormous change between the days of the coming of the railway and now.

* * * *

The Value of Pooling

How widespread can be the influence of such a train as the Silver Jubilee is admirably illustrated by a letter from a correspondent which appears on page 730 of this issue. Having stayed overnight in Carlisle, and desiring to get to London as early as reasonably possible on the next afternoon, he found that by taking the L.N.E.R. semi-fast cross-country train at 8.10 a.m. to Newcastle, and there catching the Silver Jubilee, he could be in King's Cross at 2 p.m., two hours earlier than if he had taken the L.M.S.R. 8.30 a.m. train—the only up L.M.S. service between breakfast-time and midday—and reached Euston at 4 p.m. The L.N.E.R. journey is roughly fifty miles longer, by reason of the Newcastle circuit, but even though the passenger were to hold a ticket issued by the L.M.S.R., the L.N.E.R. route would be open to him by reason of the pooling of traffic between the two companies. Indeed, there is here a striking example of the way in which pooling may benefit a passenger by giving him not merely choice of route, but a fast service by the alternative route at an hour of the day when the direct route has nothing attractive in the way of speed to offer. Unfortunately the down Silver Jubilee working does not offer a comparable facility, for there is no connection from Newcastle to Carlisle after 9.30 p.m.

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Collection and Delivery in the U.S.A.

In our Road Transport Section on February 14 we commented on the decision of the U.S.A. railways of the West and South (and certain in the East) to inaugurate free collection and delivery. The Baltimore & Ohio Railroad arranged to establish a similar system at all principal agency points on April 1. There is no distance limitation, and the service is available to or from any point in the United States. Where shippers and receivers furnish their own cartage to and from the stations at which the pick-up and delivery service is effective, an allowance of five cents on each 100 lb. is made. Under this plan, shippers in places served by the B. & O. notify the railroad's agent that they have goods to forward. The agent then arranges to have the shipment hauled to the station without additional charge to the shipper, for rail movement to destination. On incoming less-than-carload freight the shipment is automatically moved by the railway from the station to the consignee's place of business. Railways in the territory west of the Mississippi (including the Alton, wholly-owned by the B. & O.) introduced this plan on January 17, and important carriers in the Southern territory have followed suit. Most of the lines in the Eastern territory had agreed to provide this service by April 1, so that it would now have been generally effective throughout the country, but latest information goes to show that the date of inauguration has been postponed by the Interstate Commerce Commission, probably until November 1.

* * * *

Asleep on the Footplate

Two accidents caused by enginemen being asleep as a consequence of excessive hours of duty have occurred recently in the U.S.A., and have been reported on by the inspectors of the Bureau of Safety. One happened on September 10, 1935, near Warren, Virginia, on the Richmond Division of the Chesapeake and Ohio Railway, when a train which should have stopped in a loop line to meet another train continued through and collided with it on the single line. The driver, who had been on duty 11 hr. 20 min., was asleep, and his fireman was busy with the coal in the tender, and failed to notice it. The brakeman was careless in taking no steps to stop the train when it overran the station. The second accident took place seven days later on the New Haven line at Westport, Connecticut. A goods train was stopped owing to brake trouble, and another goods train overran the automatic signals and crashed into it. The driver was killed. A flagman was supposed to be protecting the train which had stopped, but he had gone back only a short way, and neglected to put down detonators, his signals being thus useless. The driver of the following train had been on duty fourteen hours and is believed to have fallen asleep shortly before the collision took place. Had detonators been put down they might have awakened him to the position. The guard of the first train was held to blame for not seeing that his brakeman went back the correct distance and provided the full protection prescribed by the rules.

* * * *

Adhesion Weight and Total Weight

In a paper read by Mr. L. K. Sillcox, Vice-President of the New York Air Brake Company, before the Engineering Institute of Canada recently, the question of weight distribution in locomotives was considered. As the author said, there is little opportunity for reducing the weight carried on the coupled wheels of locomotives, because good use is already made of it to increase the drawbar pull which can be exerted without slipping. Moreover, a four-wheeled leading bogie bearing sufficient weight to make it an effective guiding unit is essential in high speed service. There is, in consequence, no opportunity for weight economy except in the axle loading of the trailing truck, and the weight at this point is frequently used for improving the starting and power output of the locomotive by fitting a trailing truck booster. It is sometimes desired, in the interests of economical operation, to increase the boiler pressure of a steam locomotive, whilst maximum permissible rail loads prevent an increase of weight upon the coupled wheels. It is then that special boiler materials can be used to advantage for weight reduction, together with the incidental advantages of corrosion resistance and attendant lower maintenance costs.

* * * *

High-Speed Lightweight Trains

Mr. Sillcox also explored, in the paper referred to above, the subject of high-speed lightweight trains. He remarked that these trains had been enthusiastically received in the United States, where it is readily conceded that they offer new opportunities for speed at low cost; but criticisms of the rather limited space provided in the first of these trains has led designers of most of the more recent examples to afford more room per passenger, whilst adhering to the general principles of the earlier constructions. Practically, in the opinion of Mr. Sillcox, the streamlining of railway trains, particularly those having a high ratio of length to cross-section, is relatively of little consequence and cannot be considered as an important technical advance. This, however, is largely contradicted by the figures he goes on to quote when he says that only at 100 m.p.h. does air resistance represent as much as 45 per cent. of the total resistance of a train consisting of a steam locomotive and ten 67-ton passenger cars of conventional type, moving through still air. At 80 m.p.h. air resistance accounts for 36 per cent. of the total, and at 60 m.p.h. approximately 25 per cent. At 60 m.p.h. the air resistance offered by an equivalent steam locomotive may be reduced approximately 36 per cent. by adopting a streamlined locomotive together with streamlined cars.

Canadian National Railways

THE recently-published report of the Canadian National Railways for the year 1935 points out that although the volume of traffic still leaves much to be desired, the gains recently made and the immediate prospects are encouraging. In operating revenues there was an increase of $8,282,000 or 5·02 per cent. over 1934, of which increase $5,114,000 was secured in the final quarter of the year. Freight revenue increased $7,626,496 or 6·05 per cent. There was an increase in tonnage on all regions, particularly on the Grand Trunk Western, which enjoyed an increase of 24·25 per cent., largely due to the action of the automobile industry in changing production schedules to eliminate the seasonal rush of previous years. The unfavourable factor in system tonnage was the decrease in the movement of agricultural products, particularly grain, resulting from unfavourable crop conditions in Western Canada. Passenger revenue increased by $313,471 or 1·9 per cent., and there was a slight advance in both mail and express traffic.

Operating expenses were higher by $6,990,170 or 4·6 per cent. To secure the increase of 1·92 per cent. in passenger traffic there was an addition of 1·3 per cent. to the passenger train mileage, and the increase of 6·05 per cent. in freight traffic necessitated an addition of 3·3 per cent. to the freight train-mileage. Operating expenses were also increased to the extent of $4,491,482 as a result of reduction in wage cuts. The 15 per cent. payroll deduction which was in force generally for all classes of employees during 1934 was on January 1, 1935, reduced to 12 per cent. and on May 1 to 10 per cent. Expenditure on locomotive fuel advanced by $879,915 or 6 per cent. One third of this increase was due to increased consumption and two-thirds to increased prices. A continued improvement in freight service operation is indicated by the following averages. Gross tons per freight train, for instance, increased from 1,535 in 1934 to 1,540 in 1935; net tons per freight train from 642 to 644; gross ton-miles per freight train hour from 24,000 to 24,900; and miles per freight train hour from 15·6 to 16·2. Fuel consumption, on the basis of lb. of coal consumed per 1,000 gross ton-miles, dropped from 120 to 118. The accompanying table compares figures for the past two years:—

	1935	1934
Average miles operated ..	23,652	23,676
Tons—revenue freight ..	38,807,718	36,966,232
Ton-miles—revenue freight	13,508,955,208	12,949,545,743
Passengers	9,721,268	10,079,911
Train-miles	44,251,753	43,193,754
Operating ratio, per cent. ..	91·77	92·14
	$	$
Freight revenue	133,744,771	126,118,275
Passenger revenue	16,644,700	16,331,229
Total railway revenue ..	173,184,502	164,902,502
Total operating expenses ..	158,926,249	151,936,079
Net operating revenue ..	14,258,253	12,966,423
Net available for interest ..	6,830,999	7,403,845
Cash deficit	47,421,465	48,407,901

Total requirements for interest on funded debt held by the public and for interest on Government loans for refunding were reduced from $55,811,745 to $54,252,463, principally due to the refunding of maturing and redeemable issues at lower rates of interest. Regarding co-operative measures with the Canadian Pacific Railway the report points out that although joint committees of the two companies have had under active study many co-operative projects of various kinds, the amount of preliminary detail has proved to be so great that no additional co-operative measures have been made effective. Over 500 miles of line have been recommended for abandonment by the joint committees, and other lines aggregating 1,700 miles are still under study, with a view to possible abandonment. Applications were made to the Board of Railway Commissioners for leave to abandon light traffic branch lines in 25 cases. Up to the end of the year twelve of the applications, involving 186 miles of line, had been granted, seven, which involved 183 miles, had been denied, and final decision had not been given in six cases, involving 190 miles. Increased patronage was given to Canadian National hotels during 1935. Gross revenue advanced by $262,936. Canadian National (West Indies) Steamships Limited showed an operating profit of $200,030, as against an operating deficit in 1934 of $96,678.

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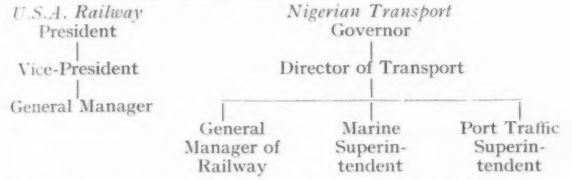
Travelling Show Trains

MANUFACTURERS and traders have of necessity to adopt continually changing methods of bringing their goods to the notice of potential customers; among the new ways of advertising which are constantly being tried the use of a travelling show train has created much interest. In 1933 J. S. Fry & Sons Ltd., with the co-operation of the Great Western Railway, adopted this method of salesmanship, and the success which it achieved has resulted in a number of other firms adopting the same principle. Travelling show trains can be arranged of any length desired, but the most practical proposition is generally a train of three coaches, one for exhibition purposes, another for sleeping accommodation for the salesmen, and the third for an oil driven generator to light and heat the train, and provide power for cooking. This general plan can of course be varied to suit particular requirements, and the railway companies will at any time co-operate with firms in suggesting the most appropriate type of coach for particular conditions. After selection, the coaches are stripped by the railway company of all internal fittings and passed to the firm concerned, which arranges for them to be fitted and re-decorated as desired. Firms may also paint and letter the outside of the coaches and the roof label boards to their own taste. When the coaches are finished and fully stocked, the railway companies require them to be insured by the promoter under a comprehensive policy, which can be obtained, however, at an extremely low premium. A tour of important towns is arranged, and detailed timetables planned; the coaches are usually moved from town to town by express trains during the night, thus assisting to secure the maximum publicity for the goods.

Upon arrival at a particular town, the train is berthed in an easily accessible position in the passenger or goods station, and it is then thrown open for inspection by customers and buyers who have been invited previously. The main purpose of the show train is to exhibit to existing customers ranges of goods or merchandise which ordinarily it would be difficult and costly to bring to their notice, and also to attract potential customers by inviting them to accept the firm's hospitality and inspect its products in their home town. Retail trading, therefore, is not usually carried out from the trains, but orders are booked for immediate delivery from the firm's nearest depot. The charge for the haulage of the trains is based upon the exceptional owner's risk scale of rates for loaded vans, and as reduced fares are charged for the conveyance of the firm's staff, the total cost of a fairly comprehensive tour compares quite favourably with other forms of advertising, particularly when regard is had to the novelty of the method and the close contact which is achieved with buyers over a wide area. Travelling show trains have been arranged for the exhibition of shoe-repairing machinery, gramophones, and wireless apparatus, and negotiations are in progress with a number of firms.

Nigerian Transport

IN a Sessional Paper recently presented to the Legislative Council of Nigeria, a new transport organisation for the Colony was outlined and this is soon to come into operation under the guidance of a Director of Transport. In the new organisation the Director of Transport, who is responsible to the Governor, assumes executive control of the Government Railway, Port and Marine Services; the General Manager of the railway, the Port Traffic Superintendent, and the Superintendent of Marine reporting to him directly. The position of the executive heads of the three transport services will be similar to that of the General Manager of a railway in the U.S.A., and is illustrated in the following chart:—



Port Advisory Boards also are to be established at Lagos and Port Harcourt.

The transport affairs of a large colony (Nigeria is about four times the size of the United Kingdom and has about 20,000,000 inhabitants) have become very complex under the more elaborate organisation of present-day administration. The more extensive use of statistics with the object of attaining greater efficiency, and the more careful scrutiny of every detail of administration, have made it advisable to relieve the executive heads of the three services named above of the various matters of policy and finance with which much of their time has necessarily had to be occupied in the immediate past. Under the new transport organisation the Director of Transport will deal personally with "special" transport matters, with co-ordinating finance and staff, and with matters of principle affecting the Colony as a whole. Among the immediate matters which will fall under the consideration of the new Director of Transport will be a further co-ordination of rail, port, road, river and air transport. The head of the transport services of a large and developing Crown Colony such as Nigeria requires special qualifications, and it is fortunate that Mr. G. V. O. Bulkeley, until now General Manager of the Nigerian Railway, is available on the spot with every qualification necessary to assume the task of first Director of Nigerian Transport.

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The Shrivenham Accident

THE Great Western Railway's "outstanding record of immunity from passenger fatality in train accidents," to quote the words of Lt.-Col. A. H. L. Mount's report, the principal parts of which will be found summarised on another page, was unfortunately marred on January 15 by the accident at Shrivenham, when an express from Penzance collided with some wagons that had broken away from a mineral train. Considering the speed—about 50 m.p.h.—at which it is estimated the passenger train was travelling, and the damage done to the first two vehicles it is indeed remarkable that the casuality list was not worse. The general facts of this accident are not in question, and, as will be seen from our summary, a failure of material, always liable to occur even when every precaution is taken, was followed by a failure of the human element. From this point of view, one of great concern to the railway officer, the accident must be regarded as a grave one. Two signalmen in succession failed to notice that the mineral train was incomplete, resulting in the acceptance of the express into an occupied section; moreover, the guard of the mineral train was, in Colonel Mount's opinion, not on the alert, and had sufficient time to have protected his train with detonators, even when every allowance is made in his favour. These failures of men with good records are disturbing. Where equipment, such as track circuiting throughout, is not provided reliance is placed on the signalman, and the primary reason for having him at all is to make use of his powers of observation. If he fails just when he is wanted, on the few occasions on which something is left behind on the line, it is not surprising that attention should be more and more directed to eliminating the human element and replacing the man by mechanism. The policy of providing local track circuiting in station and signal-box areas, so much followed in recent years, has been the correct one, in Colonel Mount's opinion, and he shows that it would have been effective in most cases where mistakes were made. It is true that continuous track circuit will cover breakaways in section, but it is conceivable that other means of doing so may eventually be developed, such as the tail signal detector, now being tried abroad.

The inaccuracy of the signal-box clocks figures a good deal in this case, and recommendations are made tending to improve matters. Not only do inaccurate clocks complicate investigation of any occurrence, but they must necessarily make it difficult for signalmen to decide correctly how to deal with a given train at certain times. We have frequently noticed inaccurate station clocks, and can see little excuse for it in these days of scientific horology, electric and other clocks of great accuracy, and wireless time signals several times a day. A good time system throughout the railway, and clocks that keep to it, is one of the essential things in these days of increasing speeds and close running. Railway time ought to be everywhere a model to go by, but when clocks in two adjacent signal-boxes are nearly five minutes different it is clear that we are far from scientific accuracy.

Even when there is no danger, every breakaway must give rise to tiresome delay, so that the operating officer must heartily wish for couplings that will never fail. As a result of the Dagenham accident, when Colonel Mount dwelt on the necessity of giving close attention to the subject, and of the railways continuing the investigations they had then begun into the question of strengthening drawgear to a breaking stress of not less than 60 tons, an improvement in the number of breakaways has occurred; it is still somewhat disquieting, however, that the provisional figures for last year reveal some 3,200 cases of failures of drawgear or coupling links in running trains. An improved situation has certainly obtained since March 31, 1935, the date after which all new drawgear had to be of the approved new design and material, the effects of which must in due course be felt; nevertheless, the tendency to increased speeds of all classes of trains, and heavier loads, makes it desirable, we feel, to pursue the whole question of coupling goods trains further. The behaviour of vehicles, other than of all-steel construction, in collision can never be a matter of much certainty, and the passengers in the first coach, the body of which was torn off the frame and hurled aside over the bank, coming to rest upside down, might have been expected to fare far worse than they did. They evidently benefited from the fact that the body of this coach was covered with sheet steel panelling, and survived much better than the second coach, the body of which had wooden external panelling and which collapsed. Luckily there was nobody in the second vehicle, which was a van. The company has decided to retain a brake van as one leading vehicle in all long-distance trains, as far as practicable; hitherto

there have been no instructions prohibiting a passenger vehicle being next to the engine. The automatic train control, to which much reference was made at one time in the daily press, had nothing to do with the accident, since the signals were themselves falsely at "clear." Colonel Mount finds that the dead engine driver and his fireman were both alert and did their utmost to pull up when they saw the tail signals of the stationary wagons. Atmospheric conditions were not very good, it would seem, or they might have reduced speed considerably before the impact. The inspecting officer has again received suggestions with regard to the use of flares and Very lights as warnings, but does not consider they would bring any advantage over the use of detonators. In any case, if the man who is to give the warning is not alive to his duty, no apparatus one may give him will be of service.

LETTERS TO THE EDITOR

(*The Editor is not responsible for the opinions of correspondents*)

Carriage Door Locks

Bradnor, Whetstone, N.20.
April 10

To the Editor of The Railway Gazette

Sir,—I notice that in the new coaching stock of the Great Western Railway, a reversion has been made to the springless door fastenings formerly used on the G.W.R. These are open to serious objections. From the passengers' point of view they are stiff and awkward, ladies often find it impossible to turn them, and when a train is standing at a curved platform the doors on the concave side will not keep shut. After entering it is necessary to let down the window, itself not easy with the door swinging open, turn the stiff and dirty handle and reclose the window, only to find the door swinging open again after the next passenger has entered.

A graver defect is that on the *convex* side of the train the doors will remain shut without being in any way fastened. If this should be overlooked by the station staff a door may open without warning when the train is moving, with possibly fatal results.

The Great Western was the last of all our railways to adopt spring door locks and when it did so a few years back it was hoped the old G.W.R. lock would at long length die out, and the reversion to it is inexplicable. The Great Western appears at times singularly out of touch with modern practice, but it is to be hoped that in the interests of safety alone the company may be persuaded to employ some form of spring lock.

L. A. FULLAGAR

[We are informed by the G.W.R. that, although the slam pattern lock is being fitted to suburban coaches where the continual opening and shutting really calls for a lock of this description, it is not considered that the additional expense of fitting a slam lock pattern to main line stock, where the doors are not so frequently opened, is justified. The experience of the G.W.R. is that, in spite of the safety catch on the slam lock, more accidents occurred with them than with the company's ordinary standard pattern; not however that accidents have been due to any defect in the slam locks, but some accidents were caused by their being so easily operated from the inside without lowering the window, and people meddling with the locks during the journey.—Ed. *R.G.*]

Faster Business Travel

London, April 10

To the Editor of The Railway Gazette

Sir,—I have been considerably interested to read the Editorial comments in your April 3 issue on the train service between the West of Scotland and London. A short time ago I had an engagement in Greenock which terminated at about 9.45 p.m. The following day I had to be in Nottingham by 4 p.m. Notwithstanding the eighteen hours thus available between the two engagements, it was impossible to complete the journey in time by rail. The late evening trains from Greenock into Glasgow just failed to connect with the last night trains to the south; and the earliest morning train, at 9.30 a.m. from Glasgow (St. Enoch), is not due in Nottingham till 4.43 p.m., so that even if punctual it would have brought me to Nottingham an hour behind time. Finally I had to induce a friend to come specially out to Greenock with his car in order to get me to Glasgow in time for the 11.5 p.m. "sleeper" to Manchester; whereas a fast morning train to the south at about 8 a.m. out of Glasgow would have solved the difficulty.

Last week I was in Carlisle overnight, and desired to get to London as soon after midday as practicable. The only forenoon train by L.M.S.R., over its principal main line, is at 8.30 a.m., and reaches Euston at 4 p.m. But I found that by catching the 8.10 a.m. L.N.E.R. train to Newcastle, it would be possible, with the aid of the Silver Jubilee express, to be in London (King's Cross) by 2 p.m., notwithstanding the 60-mile cross-country journey, with numerous stops, before the Silver Jubilee could be joined. That is to say, starting 20 min. earlier, I could be in town two hours earlier. The fact, to my mind, witnessed both to the value of such a facility as the Silver Jubilee, and to the need for a better morning service over the L.M.S.R. main line to London. Scrutiny of the timetable showed this 8.10 a.m. L.N.E.R. service to be easily the quickest from Carlisle to London anywhere between midnight and midday; and despite its extra 50 miles of travel it is only 20 min. slower in overall journey time than the non-stop Royal Scot, which leaves at 12.10 p.m.

VERITAS

A Manchester-Liverpool Monorail Scheme

56, St. Mary's Mansions, W.2.
April 14

To the Editor of The Railway Gazette

Sir,—Following the editorial article on monorails in your issue of January 24, I have turned up among my papers a copy of the original prospectus issued in July, 1903, by the Manchester & Liverpool Electric Express Railway Company. This company was incorporated by Act of August 17, 1901, and by that Act and a subsequent Act of June 23, 1902, was empowered to construct an electric railway on the Behr monorail system between Liverpool and Manchester. It was proposed to maintain a ten-minute service of trains running at speeds up to 110 m.p.h., which would accomplish the 34½-mile journey in 20 min. Mr. Fritz Bernhard Behr (who, with Mr. R. Elliott-Cooper, was Engineer of the project), had constructed the Lartigue monorail from Listowel to Ballybunion, in Ireland, and proposed to adopt the same system, modified for the higher speeds envisaged. The Act of 1901, which had been prefaced by sittings of parliamentary committees totalling 37 days, and involving the examination of 84 witnesses, stipulated that the line should be completed by August 17, 1906. However, the company was unable to raise its capital of £2,100,000.

The terminal stations were to have been in Deansgate, Manchester, and School Lane, Liverpool, and the line was intended to pass through the outskirts of Garston and Warrington, later curving slightly northwards to enter Manchester by way of Barton and Eccles. Gradients would have been undulating throughout, with a maximum inclination between the termini, apart from a brief stretch at 1 in 81, of 1 in 150. Gradients of 1 in 30 and 1 in 25 outside the stations at Manchester and Liverpool respectively were to assist accelerations and deceleration. The promoters proposed to use one-coach trains propelled by four d.c. motors with a normal rating of 160 h.p., and it was intended to form these vehicles "with pointed ends, somewhat after the manner of a lifeboat, in order to reduce the resistance of the wind. . . ."

R. E. CHARLEWOOD

PUBLICATIONS RECEIVED

Notes and Remembrances : International Railway Congress Association. Brussels : M. Weissenbruch, 49, Rue du Poinçon. 11 in. × 8½ in. 54 pp. + 1 folding plate. No price.—The coincidence last year of the centenary of railways in Belgium and Germany with the 50th anniversary of the International Railway Congress has caused the I.R.C.A. to produce an interesting brochure bearing the full title "The Centenary of the European Railways ; and Fifty Years' Activity of the International Railway Congress Association : Notes and Remembrances." It is a well-produced work, divided into six chapters, containing a wealth of summarised information. Chapter I is entitled "The First Railways," and deals briefly with the early establishment of railway systems in the various European countries, namely, Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Great Britain, Hungary, Italy, Jugoslavia, Netherlands, Norway, Poland, Portugal, Roumania, Spain, Sweden, and Switzerland. Subsequent chapters outline the inception of the I.R.C.A. and its work during the past fifty years. These are followed by a list of the members of the Permanent Commission (with an inset plate of 67 portraits) ; the countries embraced by the I.R.C.A. ; and a note on the programme of the association. As a companion to this brochure, an album containing maps of the various railway systems in 1885 and in 1935 is now in course of preparation and will be published separately.

London Transport Green Line Coach Guide, No. 1. Published for the London Passenger Transport Board by Index Publishers (Dunstable) Limited. 6¾ in. × 4¼ in. 192 pp. and folding map. Price 2d.—After careful examination of the requirements of passengers, the London Passenger Transport Board is revising its system of issuing timetable guides. So that complete information may be given, the London guide, containing coach, central bus, tram, and trolleybus schedules, and a brief summary of underground railway services, will be split up at the end of April into three separate guides. These will deal with : (1) Green Line coach services ; (2) all railway services ; (3) central bus, tram, and trolleybus services. Each guide will cost 2d. The first issue of the Green Line coach guide, in a light blue cover with a green horizontal band, was published on Thursday, April 9 ; it is available on the coaches, as well as at bookstalls. The railway guide is to be published on April 25. In addition, a scheme to issue a comprehensive series of town guides has been approved. The first group of these guides—for the Western area—probably will be published in July.

No. 1 of the Green Line guide, which is now before us, begins with an index, which is followed by detailed timetables of every service. After these are fare charts showing single and return fares for each route, and, separately, season ticket rates. Other features are a list of authorised stopping places ; a list of country bus routes ; and sketch maps showing the position of boarding points in Central London.

Cahiers des Charges et Spécifications Techniques des Grands Réseaux de Chemins de Fer. (Standard Specifications of the French Railways.) Revised to November, 1935. Paris : Dunod. 6 in. × 4 in. Leaflets and booklets up to No. 224 in pegamoid portfolio. Fr. 193.—The advantages of the loose leaf arrangement of these specifications are brought forcibly to our notice by the fact that there are already some three dozen revisions of, or additions to, the collection reviewed in THE RAILWAY GAZETTE of November 1, 1935. All of these can be purchased separately, at prices ranging from 1 to 12 francs, thus bringing the set into agreement with the new issue. Without again referring to the general purpose and scope of these specifications and standards, for which the earlier review may be consulted, it may be noted that modifications have been introduced in the specifications concerning wagons and vans for slow traffic, axlebox accessories, steel ropes, steel coaches for fast traffic, components for continuous brake gear, plywood panels, metal sheet, steel wire, hose for fire pumps and water cranes, cordage, steel rounds and plates of various types, paints, and antimony. The materials and products covered by new specifications, published since the issue of the previous collection, include stampings and rolled or drawn pieces in copper alloys, rubber washers and packings, soaps, lamp wicks, coatings of tin, zinc and lead, wiping cloths, glass paper and emery cloth, creosote, manila rope, electric lamps (filament), vaseline, greases and animal oil. A revised index is supplied including all the new and modified publications.

Aus der Frühzeit der Eisenbahnen (From the First Days of Railways). By Dr. Max Hoeltzel, Honorary Member of the Friedrich List Society. Berlin : Julius Springer, Linkstrasse 23-24. 9¼ in. × 6 in. 111 pp. Paper covers. Price RM. 4.—The German railway centenary has been the occasion for the issue of a considerable amount of literature, ranging from the popular and descriptive to the purely technical, including not a few books and many special numbers of journals. All those that we have seen have been not only very interesting, but well produced and based on much research of that uniformly painstaking kind so characteristic of the Germans. The present work is of modest dimensions, but, as its author remarks with justice, its size conveys very little idea of the amount of labour necessary to compile it. Dr. Hoeltzel has rendered a service to students of railway history by issuing this comprehensive bibliography of works, pamphlets and articles covering what may be called the pioneer period of railway promotion and development, that is from 1800 to 1850, and in which he has apparently contrived to include everything of any consequence published in Europe. The task has occupied him a long time, much of it spent abroad, at London, Oxford, Paris, &c., in research in libraries and private collections. Anonymous publications are given in a separate list in order of time, and the remainder alphabetically, after their authors' names. A few American publications are included, but the author was unable to find as much as he had hoped from American sources, so many writings having a purely local interest. In all, some 1,000 items are given. It is rather surprising to see how much was written in German on the subject of railways in those early years, of which Friedrich List's works form quite a respectable collection in themselves. The book has a preface by Professor Carl Pirath and an introduction outlining the development of the railway idea in Germany, containing some interesting facts. There are one or two small errors, such as the date of the original *Railway Magazine*, given as 1836 instead of 1835, or a name spelt incorrectly, but they are quite insignificant compared with the study and labour exhibited in the book, which is a very useful addition to railway historical literature at a most reasonable price.

Metro-Vick Calendar.—This year the Metropolitan-Vickers Electrical Co. Ltd. has selected as the subject of its "girl" calendar neither a famous actress nor a film star. Instead, a charming English blonde, who likes to be known as "Cynthia," has been chosen. It is appropriate that these much-looked for calendars should be unorthodox and become current only at the beginning of spring instead of on New Year's day.

Finland for 1936.—We have received from the Finnish Travel Bureau, of 7, Victoria Street, London, S.W.1, a travel booklet with the above title, setting forth the charms, beauties and amenities of Finland as a holiday resort. In the brief description of that unspoilt and yet no longer mysterious country, attention is called to its 60,000 lakes and 80,000 islands, its pine, spruce and birch forests, its salmon and trout streams, its fine air and pleasure amenities. Finland claims to be the cheapest country in Europe, with the lowest travel fares and hotel charges, though modern, clean and efficient accommodation and service are provided. Its sunshine is emphasised, and its facilities for exploring the region of the Arctic and the Midnight Sun during the long days of summer are reviewed. The various routes from London by sea, land and air are dealt with extensively, as are hotels and resorts, tours, camping, fishing, shooting, yachting and winter sports arrangements. In fact, a remarkable variety of holidays in a new and most attractive field is offered in this well-prepared little book.

THE SCRAP HEAP

L.P.T.B. AND SOUTHERN PLAY MARBLES

The London Passenger Transport Board, never content to rest on their laurels, won the all-England marbles championship to-day. That other great marble-playing institution, the Southern Railway, were runners-up, and their famous marksman, Big Bert Botting, had the championship in the individual contests wrested from him by Frank Harding, of London Transport.—*From "The Times."*

* * *

One of the most unusual problems encountered in constructing a large building is being tackled by architects and engineers responsible for the reconstruction of the L.M.S.R. Queen's Hotel at Leeds. Underneath the site of the new hotel is an old goyt, comprising an arched tunnel about 150 yd. long, 30 ft. deep and 35 ft. wide, through which water once flowed from the River Aire to feed some nearby mills. An important section of the foundations of the new hotel must rest upon the bed of this watercourse, long since dried-up, and work is now in progress laying the foundations for the steel stanchions which will support part of the eight-storey building. This work is being done before the actual stone arch of the old goyt is removed, and is therefore being carried out underground. It is estimated that this part of the work alone will take about three months; a mechanical excavator is at work on the bed of the old goyt, and a cart road has been made from one end of the tunnel to ground level in order to enable the spoil to be removed.

* * *

THE MODEL RAILWAY HOBBY

Margaret Lane, in an article in last Monday's *Daily Mail*, wrote:—

"Of all the hobbies that reach the proportions of unholy passion, the model railway hobby is the deadliest. It turns husbands into stay-at-homes, spare bedrooms into permanent railway systems, and the enthusiasts arranging the Model Railway Exhibition which opens at Central Hall, Westminster, tomorrow, are cheerfully giving up their Easter holiday in the great cause of model railways.

"Yes, we always have to work right through Easter Sunday and Bank Holiday," Mr. G. P. Keen, chairman of the Model Railway Club, admits cheerfully, "otherwise the exhibition wouldn't be ready in time."

The model railway fever, apparently, attacks people of all ages, in all walks of life, and of both sexes. . . .

It is impossible to say what kind of people become model railway addicts, for the club's membership is the most varied possible. Mr. Owen Nares, the actor; a couple of Bow-street police constables; the Marquess of Milford Haven; a Metropolitan Water Board collector; retired colonels and naval men; serving soldiers and City clerks . . . the varieties go on for ever.

"Members' wives often give me their views of it as a hobby," said Mr. Keen. "One woman will say, 'Thank heaven, George now has something that keeps him at home,' and another will say, 'What have you done to my husband I can't get him to take me out any more.'"

* * *

A SLIP CARRIAGE MYSTERY

Our first thought on reading the news in a daily paper recently that an L.M.S.R. passenger train had collided with a slip coach off The Flying Scotsman at Bedford, was that the vehicle in question must have slipped a very long way. The arrival at Bedford of a portion of the Flying Scotsman, however, although it would occasion more general comment than seems to have been evoked in this instance, is not physically impossible as far as rail connections are concerned. Had the coach been slipped (by accident or design) at Hitchin, and had the main train crossed the junction with the Hitchin-Bedford branch of the L.M.S.R. sufficiently far ahead of the slip to allow time for the points to be changed, the carriage might indeed have been diverted, and, given a high initial impetus and a strong following wind, have found its way to Bedford. The train concerned, however, would have to be the down Flying Scotsman, and we are therefore at a loss to account for the fact that the collision did not occur until the arrival at Bedford of the 8.5 p.m. train from St. Pancras. Are we to suppose that the advent of so unexpected a visitor in the middle of the morning went unnoticed by the L.M.S.R. authorities until their attention was drawn to it by the sound of an impact fairly late at night? A further tax is imposed upon our credulity by the fact that the slip carriage appears in a newspaper illustration to be the property of the L.M.S.R., and we are therefore regretfully led to the conclusion that this attempted establishment of a King's Cross-Bedford service was unauthorised, that the carriage was attached to The Flying Scotsman privily, that its diversion was an act of connivance, and that the ensuing discomfiture of the perpetrators was no more than their deserts.

One Hundred Years Ago

Extracts from the April, 1836, issue of "The Railway Magazine" (afterwards "Herapath's Railway Journal") and the oldest constituent of THE RAILWAY GAZETTE

THE GREAT WESTERN RAILWAY.—At a numerous meeting of the directors and shareholders it appeared that the district between Bath and Bristol was in such a state of forwardness as to leave no doubt that portion of the railway would be constructed within the time contracted for. The subscriptions for the intersectional line of railroad to connect the Great Western with Stroud and Gloucester were complete. The only obstacle that the directors had to contend with was in respect to a terminus to the road in the metropolis.

* * *

ON THE LAYING OUT OF A RAILWAY

It is a fact no less true than surprising, that notwithstanding the experience we have had for some years of the utility of railroads, there appears to be no fixed principle on which they are planned. Our engineers seem like men working in a fog; all is confusion and uncertainty. One follows the course of the rivers; a second skips like a goat at once to the top of the hills, on what is called the principle of concentrating the inclinations: a third, as if he delights in filth and darkness, or is ashamed to be looked at in the light, burrows for a considerable portion of his way under ground; a fourth, in the true spirit of the man and his ass, lays out his line, twisting about like an eel to suit every little hamlet in the way, scarcely heeding difficulties, or whether his line will be a workable one or not; while a fifth runs into the very opposite extreme. This one shuns the towns, and wanders through wild, unfrequented places, and then boasts of the little expense of his line, forgetting that it is the returns derivable chiefly from the very towns he avoids, which are to repay the shareholders for their outlay. What does all this prove but that *system* is utterly wanting, and that our civil engineers have neither line nor rule to work by?

* * *

FOREIGN RAILROADS. — Vienna, March 11: The banker, Baron Von Sina, has presented to the Emperor a plan for an iron railroad to go from Vienna to Gongo, below Raab, to be constructed at his expense, and to go by way of Odenburg; and it is hoped the Emperor will approve of the plan. If this railroad should be carried into effect, Gongo may become the staple place for steam boats, as it has a fine harbour, and the current of the Danube from that place is rapid.

Railroad from Nuremburg to Furth.—Nuremburg, March 15: On the general meeting of the shareholders in the iron railroad it appeared that in the first quarter of a year, just ended, 74,000 persons had made use of it, which produced a receipt of 10,000 florins. It appeared further, that taking the minimum of the receipt during the winter, as the standard for the whole year, the dividend must be 13 or 14 per cent. The shares have, of course, risen still higher, and cannot now be had at 250 florins.

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

RHODESIA

Improved Traffic Receipts

The revenue and expenditure figures for the financial year ended September 30, 1935, reveal a most satisfactory increase in the earnings of the Rhodesia Railways as shown in the following comparison:—

	Year ended September 30 1935	1934	Increase
	£	£	£
Total earnings	4,558,632	3,895,490	663,142
Gross operating expenses	2,624,278	2,480,258	144,020
Net operating revenue ...	1,934,354	1,415,232	519,122

The economical working of the system is a tribute to the efficient administration, and the net operating revenue closely approaches the peak year, 1928-29, when this revenue was £2,271,618. Of the realised income for the year under review it is announced that £67,428 will be placed to the credit of the Rates Stabilisation Fund and £249,178 to the reserve account. Passengers carried increased by 59,000 to a total of 589,790 but are still far below the peak figure of 960,000 in 1930. Mineral traffic showed a continued increase, particularly with copper, chrome ore and asbestos, while coal, general goods and cement brought in appreciably increased receipts.

Optimistic Prospects

At the recent congress of the chambers of commerce of Rhodesia, the General Manager of the railways struck an optimistic note in referring to the current year's traffic prospects. He stated that while for the first four months of the year the gross revenue was down by £25,686 compared with the previous year, there was a revenue decrease of £126,000 from the conveyance of import material to the Northern Rhodesian copper mines, export copper, and coal and coke for the mines, which was offset by an increase of £100,000 in other traffics. This increase is principally general goods for Southern Rhodesia, and exports of asbestos, chrome and other minerals. The drop in copper is due to the quota operating with the world copper producers during the last twelve months, which has had the effect of reducing surplus stocks to normal. The world consumption of copper is now exceeding the production and it is anticipated that the quota will shortly be increased, which will materially affect the revenue of the railways.

New Rolling Stock

Ten petrol tank cars and six fuel-oil tank cars have recently been placed in service on the Rhodesia Railways. The tanks, underframes, buffing, and drawgear were supplied by Hurst Nelson and Co. Ltd. and the cars completed with stocks of other parts in Rhodesia. These vehicles will inaugurate the conveyance of petrol and oil in bulk from the port of Beira, where bulk installations will shortly be opened by the petrol companies.

Ten refrigerator van bodies are on order from the Gloucester Railway Carriage and Wagon Co. Ltd., and will be of 15-ton carrying capacity for the carriage of chilled beef from Bulawayo to Capetown docks. These bodies will be mounted on bogies and frames of coaching stock type, for running at passenger train speeds. The vehicles will be equipped with four pairs of roof tanks for ice and salt, with a roof door for each pair of tanks, and will be fitted with a series of 342 hooks for the suspension of the quarters of chilled beef. The bodies will be painted with an aluminium paint with a bituminous base which is considered more satisfactory than white oil paint.

INDIA

Comparative Operating Ratios

In connection with the Railway Budget speeches, outlined in the news columns of THE RAILWAY GAZETTE of March 20, there appeared an editorial note on page 546 of that issue entitled "A Silver Lining." As well as quoting comparative earnings per cent. on capital of Indian and other railways, mention was made that one of the speeches had stated that operating ratios in India were, speaking generally, better than those of other countries, in spite of rates and fares being lower than almost anywhere else. The following are some comparative operating ratios, bearing out that claim:—

Railways	Operating Ratios per cent. 1929	1933	1934
State-owned Indian	66*	71*	70*
British group ...	81	84	83
Canadian Pacific ...	79·5	83	80·5
Canadian National	82·5	96	92
Principal American	74·4†	72·7	75
German State ...	102·3‡	104·7	99·3

Railway Works Programme for 1936-37: N.W.R.

The Capital and Depreciation Fund expenditure for 1936-37 on the commercial and strategic sections of the North Western Railway amounts to Rs. 179·86 lakhs, the budget provision, after allowing for possible savings, being Rs. 165·52 lakhs. Over 80 per cent. of this expenditure will be found from the Depreciation Fund. The rolling stock programme includes the scrapping of 29 locomotives, without replacement. A modest net expenditure of Rs. 20·92 lakhs is proposed, wholly under betterments. Notable items in the betterment plan are the provision of 30 SP/S or SG/S class boilers (interchangeable), the replacement of 120 obsolete Gill type train lighting dynamos, 50 b.g. goods brake vans, 20 b.g. liquid fuel tanks and 70 b.g. CR type wagons. Track renewals form the most important item of the programme, the budgeted expenditure amounting to Rs. 24·75 lakhs from capital and Rs. 95·90 lakhs from the Depreciation Fund. The remodelling of Delhi yard, including power-signalling and track-circuiting, the construction of divisional offices at Delhi and the remodelling of Khanalampura yard are notable works in progress, which will be completed during 1936-37. The reconstruction of railway property destroyed by the earthquake of 1935 at Quetta has been estimated to involve an expenditure of Rs. 52 lakhs, and a sum of Rs. 12 lakhs is provided to begin rebuilding this year.

* Financial years ended March 31 in the year following
† 1930
‡ 1932

Great Indian Peninsula Railway

The net allotment for open line works on the G.I.P.R. amounts to Rs. 97·70 lakhs. The rolling stock programme alone is estimated to cost Rs. 50·65 and includes, under betterment proposals, 2 XP type locomotives, 52 b.g. and 2 n.g. boilers, 38 bogie coaches, 40 CR type wagons and 10 mineral oil tank wagons. Provision is also made for 18 electric bogie coaches. In a modest allotment for additions are included one electric passenger locomotive, 5 officers' carriages, 3 oil tank wagons and a breakdown crane. There is no important new work in contemplation, and the expenditure under engineering and structural works is mainly for the completion of works in hand, consisting of the remodelling of stations, sheds and yards, renewal of the superstructure of the Krishna Bridge and reconstruction of the Nalganga Bridge. The budget estimate for track renewals amounts to Rs. 29·80 lakhs.

B.B. & C.I.R.

On the Bombay, Baroda & Central India Railway, a net provision of Rs. 113·50 lakhs is made for the Capital and Depreciation Fund expenditure, wholly under open line works. The rolling stock programme is valued at Rs. 61·15 lakhs, distributed mainly under carriages and wagons. No addition to stock is contemplated. 25 YF type m.g. locomotives are under construction at the Ajmer workshops, of which 15 will be completed during the year and substantial progress will be made with the other ten. During 1936-37 the manufacture of a further batch of 8 locomotives of the same type will be begun. The provision under carriages includes 38 b.g. and 45 m.g. bogies of various classes, and that under wagons, 265 CR type, and 35 OM type b.g. wagons, 25 m.g. timber trucks, 150 M.C.J. type covered

wagons, 25 goods brake vans, and 25 live-stock wagons. A sum of Rs. 38·47 lakhs is budgeted for track renewals. Among works in hand which are due for completion during the coming year may be mentioned the Borivli-Virar electrification and the strengthening of bridges on the Rutlam-Mhow section. About Rs. 2 lakhs are being provided to increase accommodation for the booking and handling of goods traffic at Ahmedabad and Rs. 2½ lakhs to renew worn out machinery at the Ajmer and Parel shops.

Howrah Bridge Tenders

The economic factor in the distribution of large public works is given considerable prominence in the Indian press in connection with the tenders for the construction of the new Howrah Bridge. A majority of the sub-committee of the Bridge Commissioners has recommended the acceptance of the British tender which is about Rs. 18 lakhs lower than that of the Indian combine. On the other hand it is argued that the utilisation of Indian materials in a work, valued at over Rs. 200 lakhs, will assist Indian industries and relieve unemployment to an extent that will, from the point of view of economic nationalism, greatly outweigh the additional cost of the Indian tender. The Bengal-Nagpur Railway would certainly stand to gain by carrving additional material from the Tata Iron & Steel Works. It is noteworthy that the two railway Agents on the sub-committee, Messrs. A. F. Harvey (Eastern Bengal) and V. E. D. Jarrad (Bengal-Nagpur), have recommended a reference to the Government of India as to the ways and means of finding the extra cost in case the Indian combine is given the preference. The tenders considered are stated to be as follow:—

Fried. Krupps, A.G...	Rs. 209 lakhs (approx.)
Cleveland Bridge and Engineering Co. Ltd.	Rs. 214 ,, ,,
Indian Combine (Messrs. Burn, Braithwaite & Jessop)	Rs. 232 ,, ,,

The last named company has submitted an alternative design by Messrs. Freeman & Ash, which is estimated to cost about Rs. 50 lakhs less.

NEW ZEALAND

Improved Freight Train Operation

The Railways Department has just completed an extensive overhaul of the train services in the North Island, more particularly the goods services on the main lines between Auckland and Wellington and between Marton and New Plymouth, also on the recently opened Stratford-Okahukura line. The increased volume of heavy goods traffic has enabled the department to schedule for more regular running, and the use of the K class engines—of which 22 of the 30 under order have been turned out of the Hutt workshops and are now in service—has facilitated the handling of this class of traffic, as they have been found very suitable for it, as well as for express running. The re-organised timetable provides for much better continuity of movement, a result secured by linking up goods services, and not by running extra mileage.

All heavy goods trains will be hauled between Auckland and Palmerston North by the K class engines, assisted, where necessary, over the heavier grades by banking engines, which will be utilised when returning to their depots for shunting at the intermediate stations. They will take the wagons to the main subterminals to be assembled for making up the heavy trains, and thus will enable the heavier trains to be kept moving without intermediate stops for considerable distances. From Palmerston North southwards the existing Ab Pacific engine is suitable for this traffic, as the loads of the trains are considerably reduced owing to the diversion of loading to the Napier and New Plymouth lines. The proposed electrification of the Wellington-Paekakariki line has also been taken into consideration.

Redistribution of Engine Classes and Other Improvements

The use of the K engines has released a number of X class heavy goods engines, which formerly handled the heavy traffic in the main trunk section. These will be transferred to the Taumarunui-Stratford section and the Wanganui District where their improved haulage capacity will enable the lower powered engines to be released for duty where the traffic is lighter and the grades easier.

Further advancement has been possible in the matter of concentrating particular classes of engines at certain depots and in allotting engines for the class of work for which they are most suited. Coincident with this it has been found possible to reduce the number of isolated locomotive depots, thus further economising in operating costs, and with the concentration at the main depots, better rostering of the staff is obtainable and the amount of emergency plant is reduced.

The new arrangements will benefit not only the public by providing quicker transit, but also the department, due to the quicker turn-round of stock, which in turn will permit of an improved wagon supply that is so essential at peak periods. It should be noted, however, that in spite of all these improvements, the mileage is not increased to any extent, and operating costs will be substantially reduced.

Wider Field of Shops Activity

A wider field of activity for the Government Railways workshops was foreshadowed recently by the Minister of Railways, the Hon. D. G. Sullivan. Primarily, he held that they were a Government as well as a Railway Department enterprise. It was the desire of the Government not only to ensure that there would be continuous employment for all concerned, but also to increase the scope of activities in every way consistent with the economics of the situation.

"I feel," he continued, "that it would be a reasonable action on the part of the Government to use the splendid machinery and facilities and technical knowledge and skill possessed by these workshops to foster the manufacture of many parts which are, even to this day, imported. In recent times a considerable improvement in this direction has been brought about, but with the opportunities offering, the work should be, in my opinion, much further extended."

The Minister also said that when railcars were required for the South Island, as there was every indication they would be in the near future, the cars would be built at Addington.

Quite a reasonable extension of workshops' activities was the manufacture of such structural requirements as girders, gantries, towers and other allied requirements for other Government departments, and it was obvious to him from the workshops inspection he had made recently, that given the necessary professional technical knowledge and experience, there were possibilities in the future for a tremendous increase in the industrial activities of the Government Railways workshops through the manufacture of further engineering supplies and other items, even including such things as petrol engines, steel fabrication of various kinds, minting and aeroplanes.

Safety Factor in Railways

Referring to the New Zealand national investment in railways as more than £50,000,000—the largest capitalisation of all industries in the country—giving employment to some 16,000 employees, Mr. Sullivan said:

"The work of the men in the shops is as necessary for the safety of the passengers as the work in other branches of the service: if that work has not been well done, then tragedy may result. The safety factor, as it affects the public, is not only concerned with such matters as correct signalling and the proper setting of points. It requires that every detail of the manufacture, maintenance, and equipment of rolling stock shall be faithfully constructed as far as human skill and judgment will permit."

This placed an individual responsibility on every man in the workshops, continued Mr. Sullivan, but this individual responsibility, accepted by the staff, placed on the management a corresponding responsibility to see that the conditions under which the work was undertaken were such that the men could approach their duties bright, alert and efficient. "It is, therefore, my very strong desire, as I know it is of the management, that the remuneration, conditions, and hours of work shall be the best possible, consistent with what is fair and reasonable and what the circumstances of the industry can bear," he added.

UNITED STATES

Co-ordinator's Office Likely to Lapse

Some protection of railway labour in amalgamation is accorded in the Emergency Transportation Act of 1933 which expires in June, unless it is extended by Congress. This Act established the

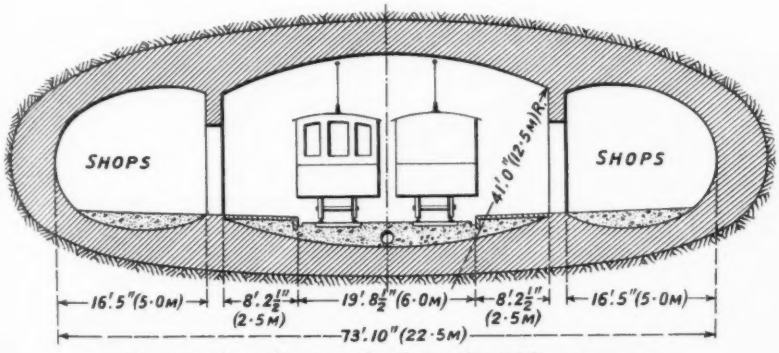
post of Federal Co-ordinator of Transportation which has been so ably filled by Hon. Joseph B. Eastman, Interstate Commerce Commissioner. For a time, it looked as if Mr. Eastman's tenure might be extended by reason of the desire of the politically powerful unions to extend the labour protective provisions of the Emergency Transportation Act.

At the present time, however, the unions are seeking this protection in a separate Bill, and there appears to remain no political group selfishly interested in continuing the Co-ordinator's post. The reason is plain: The outspoken Mr. Eastman in a number of addresses has told the truth about the railway labour situation; that the men cannot hope to have the railroad industry as a source of continued employment if they are to insist on "freezing" every employee to his present post, and permit no changes to meet present-day competitive conditions. Heretofore such criticism of union labour policy has come only from railroad managements whom it was relatively easy to discredit before the public as having a selfish interest at stake. But Mr. Eastman is known as an honest and public-minded man, not at all concerned with the selfish interests of railway managements and owners. Hence it is necessary, lest the union's policies be discredited before the public, that he be relegated to silence in the quasi-judicial post of Interstate Commerce Commissioner, which he will again assume if the Co-ordinator's office ends.

PORTUGAL

Proposed Tramway Subways for Lisbon

The increasing congestion in the streets of Lisbon, especially in the Baixa district—which is composed largely of commercial houses and offices—has led to a number of proposals for new streets and other improvements. An engineer named António Belo has put forward a scheme for two subways, one 750 m. (820 yd.) long with a short branch of 75 m. (82 yd.), the other 860 m. (940 yd.) long, with two branches of 130 m. (142 yd.), to enable the tram services to be carried underground in the most congested places. The attached sketch shows the cross-section of the proposed subways, each containing a double track tramway, two pavements for pedestrians, and shops. The removal of the trams from the surface would considerably ease the situation.



Cross section of proposed subway for Lisbon tramways

CHINA

New Constructions

The northern section of the portion of the Canton-Hankow line still under construction, from Chuchow to Hengchow, is expected to be opened on March 15, and will allow of through running between Hengchow, Changsha and Wuchang, the terminus on the Yangtze opposite Hankow. During a recent extensive tour, the Minister of Railways, Mr. Chang Kia-ngan, inspected these sections of line and saw what had to be done to bring the Wuchang-Changsha section up to the standard of the new construction for the through working of heavy traffic when the latter is open.

He also inspected the Chientang bridge construction works near Hangchow, and the older and newly constructed sections of the Chekiang-Kiangsi line thence to Nanchang, as well as the Nanchang-Kiukiang Railway, which he has ordered to be improved in many respects.

The Nanchang-Pinghsiang extension has been surveyed and proves to be about 260 km. in length. The final location survey is now in hand, and will be followed immediately by the construction, which will be carried out from both ends.

The Vulcan 4-8-4 Locomotives

One of the new Vulcan Foundry 4-8-4 locomotives [described and illustrated in our issue of November 1 last.—Ed. *R.G.*] was recently on exhibition at Shanghai North station to members of the Institutions of Mechanical and Locomotive Engineers, following a luncheon given to them by Mr. R. G. Morrison. In a speech at the luncheon Mr. Ing, Mechanical Engineer to the Ministry of Railways, said that locomotives in China had hitherto all been built to the designs of foreign builders, whereas the new 4-8-4 type was constructed to the designs and specifications of the Ministry. The design, he said, embodied maximum adhesion and had in view speeds of 80 km.p.h. (50 m.p.h.), with 25 per cent. cut-off. Dimensions were deleted from the drawings prior to their being sent out with the calls for tenders. No firm offered them exactly what they required, but the Vulcan Foundry came nearest to doing so, and its tendered dimensions needed only very slight alterations to fit in with the Ministry's requirements.

Designed for Low Maintenance and High Efficiency

Thirty years of experience with locomotives under Chinese conditions was now available and the subject of maintenance was, in consequence, being much more carefully studied, Mr. Ing pointed out. For instance, abnormal driving wheel tyre wear had caused them to insist on 90 mm., instead of the usual 70-75 mm. tyre thickness, in these new engines. Interchangeability of parts was also essential, and special attention had been paid in the 4-8-4's to the convenience and comfort of the cab: suggestions and criticisms from experienced engineers were, however, always welcome.

Mr. Kenneth Cantlie expected that, though these—the largest engines in China—were considerably more costly than ordinary ones, they would prove better designed and more economical. The tenders received had, he said, with one exception, all been very close indeed, and the builders had taken great care in the designs.

MANCHUKUO

Payment for the C.E.R.

Deliveries in kind by Japanese industrial interests to the U.S.S.R. towards the purchase by Manchukuo of the Chinese Eastern Railway, had reached some Y.80,000,000 by the end of 1935, out of a total of Y.93,000,000 in all. It may therefore be said that these deliveries have by now been practically completed. They were previously referred to in The Railway Gazette of January 10.

Participation of the Korean (Chosen) lines in the unified administration of railways on the mainland, will, if approved by the Japanese and Manchukuo authorities begin in May next.

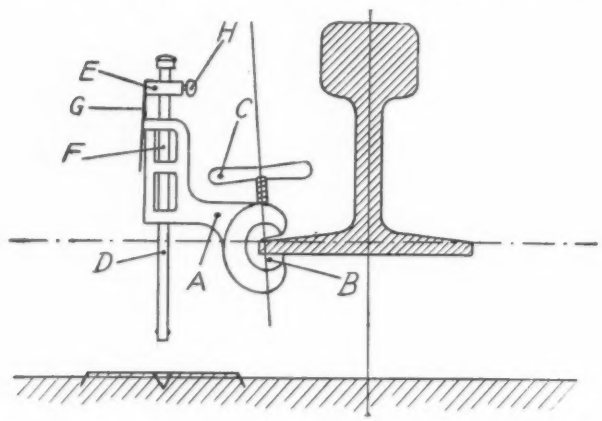
Jehol Line

The last section of the Chinhsien-Jehol line, from Pingchuan to Jehol, 112 km. (70 miles) in length, was to be opened to provisional traffic, passenger and goods, on March 10. Jehol city (or Chengte in Chinese), has thus been brought into direct rail communication with the Manchukuo State Railway system. One mixed train daily in each direction will be run for the present, covering the 204 miles in 14 hours, additional goods trains will be run when traffic offers.

TRACK MAINTENANCE BY MEASURED SHOVEL PACKING

A description of a method successfully used on French railways

THE method of levelling track by means of measured shovel packing as developed by M. Lemaire, a District Engineer of the Northern Railway of France, was fully explained in our issue for April, 1932, together with descriptions of the " dansometer " for measuring the depth of voids beneath sleepers, and a levelling telescope and sighting board for measurement of defects in the longitudinal level of rails. The accompanying illustrations show the essential features of two patterns of a " flexometer," for attachment to flat-footed and bull-headed rails respectively. This instrument is used to measure the irregularity of level in the track under load due to voids beneath sleepers. An improved levelling telescope for the measurement of permanent or static irregularity of track level not under load, due to uneven settlement of ballast is also shown. Both instruments are made by the firm of H. Morin, Paris.



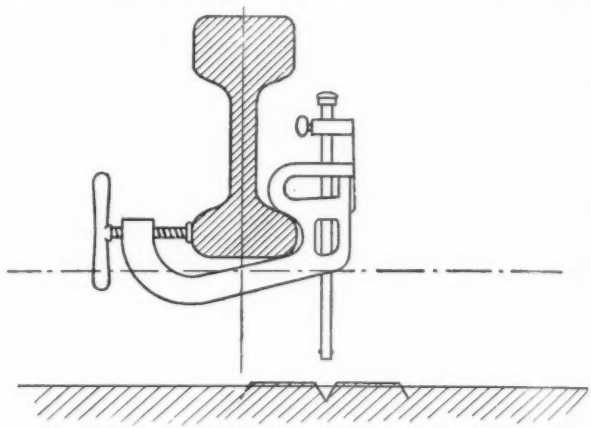


Fig. 1 (*left*)—*Flexometer for measuring depression of flanged rails due to voids beneath sleepers ;* *Fig.* 2 (*right*)—*Flexometer for bull-headed rails*

The Flexometer

As arranged for use with flat-footed rails, the " flexometer " (Fig. 1) comprises a bronze frame *A* with a bronze jaw piece *B*, which allows the instrument to be set with the rod *D* vertical, the screw *C* then being tightened to retain this adjustment and hold the instrument on the rail. The frame and clamp for bull-headed rails (Fig. 2) are of different form, but the same in principle. In both cases, the steel rod *D* is capable of sliding in the frame, a circular spring at *F* providing sufficient resistance to prevent the rod from falling by its own weight. The cursor *E* is clamped by the screw *H*, and fitted with a scale *G*, which is read against an index mark on the frame.

The flexometer is attached to the rail about 6 in. from the sleeper under observation, and the rod *D* is brought into contact with a firm stone in the ballast or, preferably, a dished metal plate provided for the purpose. The cursor *E* is pushed down on to *A* and locked by *H*. The zero of the scale *G* (on *E*) is then in line with the index mark on *A*, and the whole instrument is clear of rolling stock. When a train passes over the sleeper in question, the rail dips if there is a void under the sleeper. The rod *D* is pushed up in *A* by the amount of the rail dip, and this amount can be read at leisure on the scale *G*. The measurement thus obtained is the actual depression of the rail relative to the ballast; whereas measurements taken on the sleeper are subject to error due to play in chairs or slackness in holding screws.

Other advantages of the flexometer are its lightness and cheapness, which make it possible to effect measurements at a number of sleepers and to eliminate interpolation. A set of 12 flexometers fits in a box 30 × 20 × 16 cm. ($11\frac{13}{16}$ × $7\frac{7}{8}$ × $6\frac{5}{16}$ in.); the weight of each flexometer is 500 grm. ($17\frac{1}{2}$ oz.) for bull-headed rails and 700 grm. ($24\frac{1}{2}$ oz.) for flanged rails. All measurements are referred to the initial position of the rail (*not* the sleeper), and are comparable in accuracy with those effected by the levelling telescope.

Special Levelling Telescope

The prismatic telescope 14, Fig. 3, is mounted on a base 7 with jaws at 6 capable of gripping any standard type of rail. The pillar 9, consists of two concentric pieces, and provision is made for a small adjustment of the telescope in a vertical plane by means of the milled head 15. Internal focusing is effected by the head 13; and cross hairs are provided, the horizontal hair being used for levelling and the vertical one for rectification of the track alignment. The sighting board, Fig. 4, is provided with three scales, to facilitate readings on curved track; and its upright is fitted with a carrying handle at the top and rail grips at the bottom.

A distinctive feature of the new telescope and sighting board is that provision is made for vertical adjustment in both cases, thus eliminating the use of packing blocks to compensate for defects in the relative level of the two lines of rail. Thus, the telescope column 9, Fig. 3, can be raised by hand and locked by the screw 11, its position then being indicated on a millimetre scale. Similarly, the sighting board can be lifted up the graduated stem 5, Fig. 4, and locked by 3. With the telescope column and sighting board in their lowest position, the line of sight of the telescope corresponds with the zero line of the board. The telescope is placed at one high spot in the rail and the board at another high spot about 30 metres (say 33 yd.) away. The two instruments are levelled and the telescope is then focused on the board and the horizontal cross hair brought on to the zero line of the

board. The telescope and its mounting can be rotated sufficiently about a vertical axis to bring one or other of the scales on the board near the vertical cross hair. The board is now brought nearer to the telescope, which is not touched except for re-focusing, and the scale readings (plus or minus) are read at each sleeper. The minimum distance at which the telescope can be focused is about 8 ft. The vertical errors in the static level of the rail added to or subtracted from the flexometer readings, according as the static level is below or above the point of reference, give the total depth of packing required beneath each sleeper under the rail to which the measurements refer.

These levelling measurements are taken first on the higher rail in straight track; or on the inner rail at curves

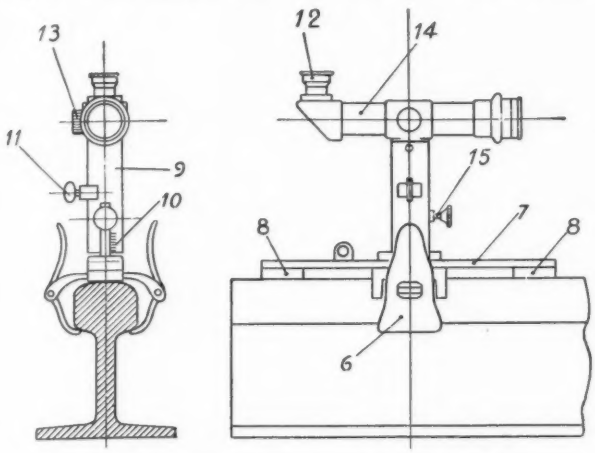


Fig. 3—Levelling telescope for use on rails

if the superelevation is inadequate, and on the outer rail if the superelevation is excessive. Taking the case of straight track, with high spots at *A* and *B* in the higher rail, the amount by which the other rail must be raised at *C* (opposite *A*) and *D* (opposite *B*) in order to obtain correct cross level, is first determined by a straight edge and level across *A* – *C* and *B* – *D*. Suppose that *C* is found to be 5 mm. ($\frac{1}{5}$ in.) low relative to *A*; and *D*, 9 mm. ($\frac{3}{8}$ in.) low relative to *B*. These are the amounts by which

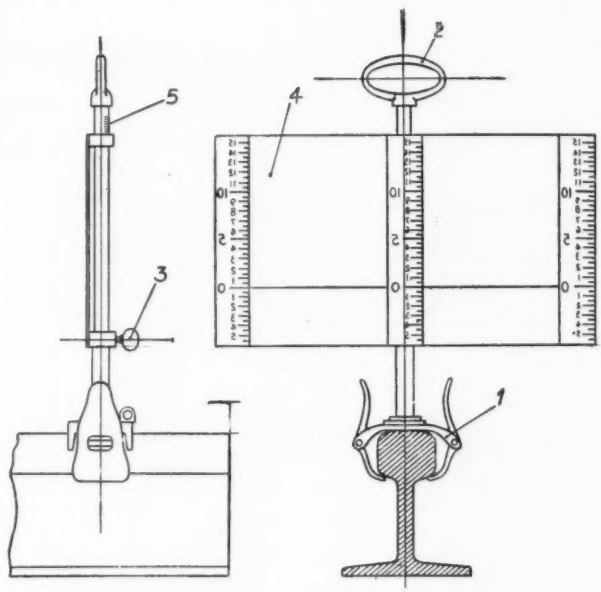


Fig. 4—Sighting board for rail levelling

the sleepers at *C* and *D* must be raised (*plus* the amount of any void beneath the sleepers under load at each point). To determine the amount of packing required at sleepers between *C* and *D*, the telescope is placed at *D* with its column 9, Fig. 3, set at 9 mm. instead of zero; similarly, the sighting board is placed at *C*, set to 5 mm. on its upright 5, Fig. 4. Clearly, the telescope and board are now at the levels of *B* and *A* respectively. The telescope cross wire is focused on the zero line of the board, and the latter is then brought to the zero of the scale on 5, Fig. 4, by releasing 3. The telescope then reads 5 mm. and, the adjustment of the telescope being unaltered, the levels read as the board is set over each sleeper in turn, are the amounts of packing required at each, in addition to the voids determined by flexometer readings. By eliminating the use of packing strips, the amount of apparatus required is reduced, and readings can be taken more rapidly and with less risk of error.

The Kaiser Ferdinands Nordbahn

One hundred years ago, on March 4, 1836, the Emperor Ferdinand I of Austria granted authority to the Viennese banking house of Rothschild to construct the first steam operated line in his dominions. Before receiving the actual Royal Assent the Rothschilds issued a pamphlet setting forth the results of an inquiry into Riepl's proposals, but, in contrast to many similar publications, the traffic and profits to be anticipated were put at a very modest level in order, so it was declared, to discourage all undue hopes. In the first year, however, the results far and away exceeded the estimate, especially the passenger traffic. Just when everything seemed to promise well, a rumour was spread that locomotives had proved a failure in England. This was, of course, encouraged by those who believed that the line threatened their particular interests. At a general meeting in October, 1836, the chairman asked the shareholders to say whether they would proceed or not, but, so clearly had a special committee set forth the real state of affairs, that only three persons favoured abandoning the scheme.

The original fifty-year concession was afterwards succeeded by another under which the State could take over the line, and it did so in 1906. The originator of it was Franz Xaver Riepl, a professor of mineralogy, an excellent bust of whom is to be seen in the Vienna Railway Museum. He proposed to develop some horse-worked mining tramways and after the success of Stephenson's *Rocket* advocated a steam railway from Vienna to Bochnia (280 miles) and then an ambitious scheme extending it to Trieste (931 miles). The capital was rapidly raised for the Nordbahn, and the first rails and locomotives were obtained from England. On November 23, 1837, the locomotive *Austria* made a trial run with a train from Florisdorf to Deutsch Wagram, but not until the Danube bridge was complete was communication established with Vienna on January 6, 1838, with an omnibus service from the station to the centre of the city. Strauss composed a waltz in honour of the undertaking. At the opening to Brünn (now Brno) in 1839 there was a collision at Branowitz which adversely affected traffic for a time. The line was completed to Cracow on August 1, 1856, but not constructed to Bochnia. One of the earliest all-electric signal installations was made on the line at Prerau Nord in 1893, by Siemens and Halske.

LEMAÎTRE VARIABLE BLAST PIPE

Improved performance obtained by the use of Lemaître blast pipe on locomotives of the Northern Railway of France

THE accompanying drawings show the distinctive features of the Lemaître blast pipe, consisting of five convergent nozzles arranged symmetrically on a circle round a central nozzle, which is also convergent but of larger diameter and at a lower level. Variation of draught, to suit the requirements of operation, is obtained by raising or lowering a " spear " of ovoid form (Fig. 2) to alter the steam passage in the central nozzle. It is claimed that this blast pipe, in conjunction with a special chimney of large diameter acting as diffuser, gives substantially better results than hitherto obtained. The subdivision of the steam flow provides a large surface of contact between the steam and the flue gases, while the form and high finish of the nozzles reduces back pressure to a minimum. The special shape and large dimensions of the chimney also contribute to the overall efficiency.

The advantages of simplicity in construction are combined with a wide range of variability. The dimensions of the Lemaître blast pipe and diffuser chimney as tried on Pacific locomotives of the series 3.1251-90 of the Northern Railway of France are shown in Fig. 2. The sectional area of the steam passage is reducible from 243 to 150·5 sq. cm. (37·7 to 23·3 sq. in.) by ten approximately equal decrements, and this wide and easy variability is particularly valuable in the working of the Nord company's very fast and often heavy trains. Curves showing the smokebox depression as a function of the back-pressure on the exhaust are shown in Fig. 3 for three settings of the blast-pipe spear, viz., Notch 0, steam passage 243 sq. cm. (37·7 sq. in.); Notch 3, steam passage 215 sq. cm. (33·3 sq. in.); and Notch 6, steam passage 183 sq. cm. (28·4 sq. in.). These curves are plotted from measurements of the smokebox depression and steam back-pressure at the points indicated by *A*, *B*, respectively on the inset drawing.

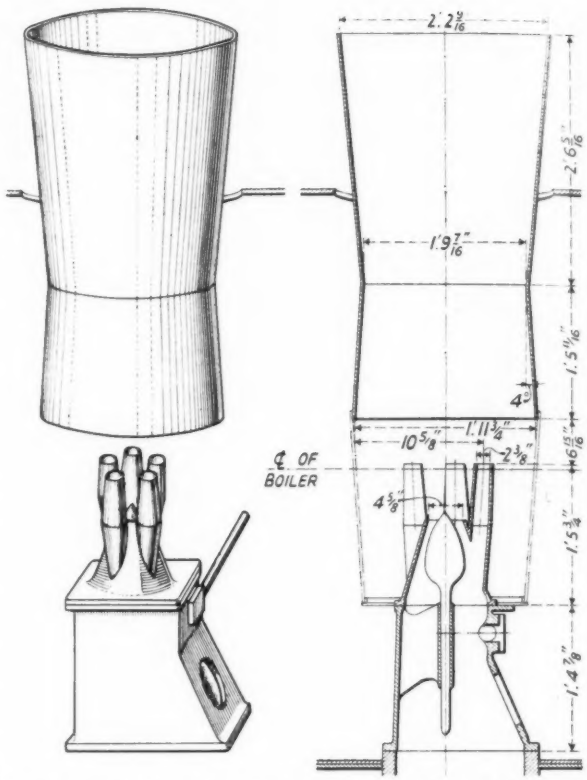


Fig. 1 (left)—General arrangement of Lemaître variable blast pipe and diffusing chimney; Fig. 2 (right)—Showing regulating spear in central nozzle of Lemaître blast pipe

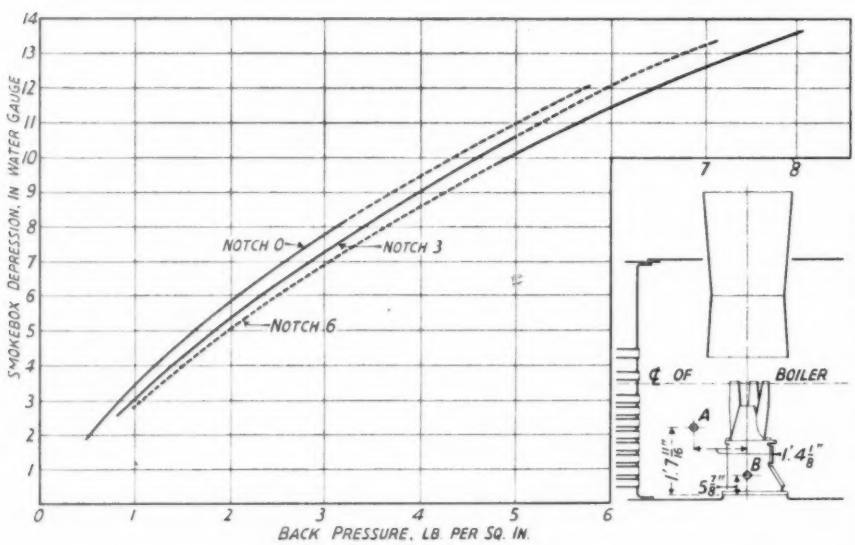


Fig. 3—Smokebox vacuum and steam back-pressure with various adjustments of Lemaître blast pipe

From trials already completed, it appears that compared with the Nord blast pipe, the Lemaître type results in an increase in power which may exceed 200 h.p. for the same rate of combustion. Alternatively, there is an average saving of fuel amounting to 10 per cent. for the same work done. Besides its applications on the Northern Railway of France and the Nord Belge, the Lemaître blast pipe is also being tried by the Belgian National Railways and the French State Railways.

Owing to the maximum speed limit of 75 m.p.h. imposed in France, hard uphill work is frequently called for, and it is under such conditions that a variable blast pipe shows to best advantage, for it enables the driver to modify the force of the blast near the end of the climb and so reduce the rate of steam generation.

NICKEL STEELS IN RAILWAY ENGINEERING—II

By L. W. JOHNSON, M.Met.

In recent years there has been a distinct trend towards the use of alloy steels for reciprocating parts such as connecting and coupling rods, because the reduction in weight which can be achieved results in a reduction of the inertia stresses; furthermore the smaller balance weights required ensure a reduction in the hammer blow and the unsprung mass. The practice in this country has been to adopt nickel-chromium or nickel-chromium-molybdenum steel with a tensile strength varying from about 50 to 70 tons per sq. in. according to the particular requirements. Typical examples will be seen in Table VI.

The use of this type of steel makes possible a saving in weight of up to 35 per cent. or more when compared with the standard Class C* carbon steel. The effect of this economy in decreasing the combined inertia and vertical stress which can be obtained is well demonstrated by the lower illustration on page 73† which compares equivalent rods in Class C steel and 50 to 60-ton alloy steel.

TABLE VII

	Per cent.
Chemical composition :	
Carbon	0·2 to 0·27
Silicon	0·15 ,, 0·35
Manganese	0·75 ,, 0·95
Sulphur, max.	0·045
Phosphorus, max.	0·045
Nickel	2·5 to 3·0

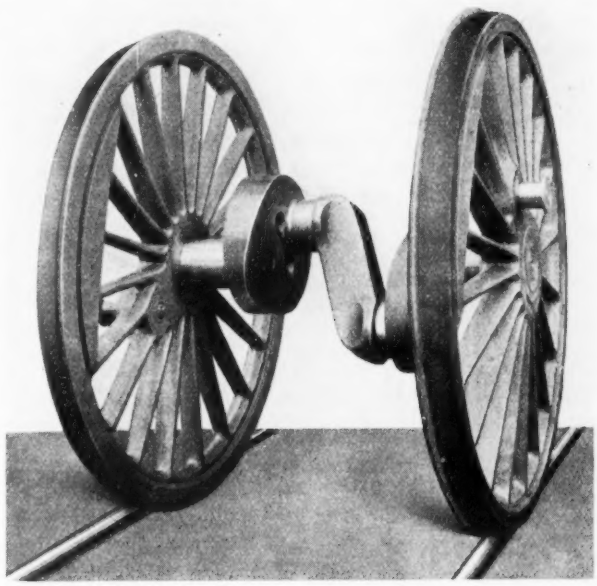
Typical tests taken from centre of forgings :

	Main rod 7 by 9 in., normalised and tempered	Crank axle pin 10½ in. diam., oil-quenched and tempered
	Per cent.	Per cent.
Carbon	0·25	0·25
Manganese	0·84	0·88
Nickel	2·65	2·63
Yield point, tons per sq. in.	29·0	33·7
Maximum stress, tons per sq. in.	38·2	42·9
Elongation, per cent. on 2 in.	33·0	29·0
Reduction of area, per cent.	69·5	59·0

In America tensile strength has been increased by adding nickel rather than by increasing the carbon, owing to the fact that the latter element lowers the toughness whereas with the former it is still retained or increased with a simultaneous increase in elastic properties. Large forgings are usually normalised to refine the structure and then tempered at a high temperature in order to remove internal stress. This type of steel is also successfully used in the heat-treated condition for such components as driving axles, the centre crank pin on three-cylinder locomotives, and piston rods. Table VII gives details of this steel.

Crank Axles

There still appears to be a difference of opinion as to the most satisfactory type of material for crank axles, steels varying in tensile strength from about 28 up to about 50 tons per sq. in. being used. In this connection it is of interest to note that in the days of the old Midland Railway it was found that a mild carbon steel having



Locomotive driving wheels mounted on a 5 per cent. nickel steel axle

a tensile strength of at least 28 to 32 tons per sq. in., and a maximum carbon content of about 0·25 per cent., gave the longest life. In other words, in order to cope with the variable shock loading to which a crank axle is subjected, it was found advantageous to obtain as ductile and tough a material as possible, consistent with suitable strength. Assuming that in certain cases it may be necessary to increase the tensile strength of a steel for a crank axle, and taking the findings of the old Midland Railway as a basis, it will be obvious that the higher tensile steel must still be tough and, as we have seen previously, this can most readily be achieved by the addition of nickel. Actually certain Continental railways such as the Bulgarian and Rumanian State Railways and the Austrian Federal Railways, have adopted as standard 5 per cent. nickel steel having a tensile strength of 38 to 40 tons per sq. in., and a minimum elongation of 18 per cent. on 8 in.*

Frames

In Great Britain, mild steel plate is the usual material of construction for locomotive frames, but in those cases where it is necessary to save weight, the 2 per cent. nickel steel mentioned above for boilers will be found to be suitable.

In North America, where cast steel frames are more generally favoured, the Canadian Pacific Railway† some few years ago carried out a very careful investigation into the most suitable material for locomotive frame castings which would possess a moderate tensile strength, coupled with a high degree of ductility and toughness,

* Tensile strength, 32 to 38 tons per sq. in.

† Due to B. Reed, "Alloy Steels in Locomotive Practice," *Mechanical World and Engineering Record*, June 12, 1931, p. 562.

* "Locomotive Crank Axles," by F. L. Baxter, *Engineer*, June 29, 1935, pp. 646–8

† "Selecting Alloy Steels for Locomotive Frames," by W. A. Newman and C. F. Pascoe, *Iron Age*, January 14 and 18, 1932, pp. 172–5 and 284–300.

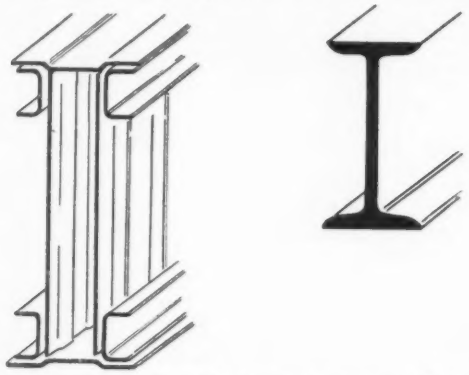
especially at the low temperatures at which locomotives in Canada are occasionally operated. Their choice finally fell on to a 2 per cent. nickel steel of which the following composition is typical:—

	Per cent.
Carbon	0·14
Manganese	0·69
Nickel	2·0

and the average of 2,650 tests taken over four years showed the following properties:—

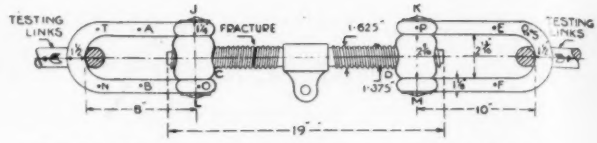
	Per cent.
Yield point, tons per sq. in.	22·25
Maximum stress, tons per sq. in.	36·3
Elongation, per cent.	30·3
Reduction of area, per cent.	61·2

A series of Izod impact tests on pieces cut longitudinally, transversely, and vertically from the outside and centre



Beams drawn to scale with the same moment of inertia. Box girder (0·012 in. side webs and 0·05 in. chord strips) of welded 18/8 chromium-nickel stainless steel strip, weighs 38 per cent. of 5-in. (10 lb. per ft.) structural steel I beam. Will carry 50 per cent. greater bending moment when using factors of safety of 6 and 4 respectively, and has tensile strength 2½ times as great

of a test piece measuring 6 in. by 6 in. by 24 in. and cast integrally with the locomotive frame, averaged 60 ft.-lb. The heat-treatment given to the castings consisted of homogenising at 980° C. followed by normalising



Results of test on Vibrac 2½ per cent. nickel-chromium-molybdenum steel link and pin coupling

at 760° C., sometimes followed by tempering at 540° C. to 650° C.

Incidentally, it was pointed out by the authors that if any welding is to be done it is necessary to keep the manganese content well below 1·0 per cent. in order to avoid any tendency to produce local hardening.

Corrosion-resisting and heat-resisting nickel-chromium steels are finding extensive application on locomotives for such parts as clothing belts, whistle components, fire-doors and deflector plates. While ordinary carbon steel castings are generally used for the locomotive drivers, mention may be made of a recent change by the Pennsylvania Railroad which in order to reduce to a minimum any chances of spoke failure by shock or fatigue, is using both a 1½ per cent. nickel-molybdenum and a 1½ per cent. nickel-vanadium steel. Either of these will give the following minimum properties:—

Yield point, tons per sq. in.	24·5
Maximum stress, tons per sq. in.	38
Elongation, per cent.	22
Reduction of area, per cent.	40

On actual test pieces taken from castings these properties were easily obtained and impact tests gave values of from 30 to 35 ft.-lb.

Rolling Stock Uses

Couplings.—A 3 per cent. nickel-chromium or nickel-chromium-molybdenum steel is often used for screw couplings, the tensile strength varying between 50 and 70 tons per sq. in., according to the particular requirements. The advantage of this type of material is two-fold: in the first place a lighter coupling, which greatly facilitates handling, can be used, and in the second place, owing to the high tensile strength, the threads do not distort and consequently jam, as has been found to happen when wrought iron or mild steel is employed. In Table VIII will be found particulars of a test carried out on a nickel-

TABLE VIII

Position of gauge points	Movement and set, in inches Load in tons	1	18	30	35	40	50	60	70	80	85	Max. stress: Tons	Max. stress: Tons per sq. in. bottom of thread	Reduction of area per cent. at bottom of thread	Position and appearance of fracture
AB = 4″	Closing in	zero	0·02	0·05	0·06	0·08	0·13	0·22	0·31	0·37	0·41				
	Set	—	—	—	none	0·02	0·08	0·17	0·25	0·31	0·35				
CD = 12″	Extension	zero	—	—	—	none	0·02	0·03	0·04	0·05	0·06				
	Set	—	—	—	—	—	—	—	—	—	none				
EF = 4″	Closing in	zero	0·02	0·05	0·06	0·09	0·17	0·25	0·31	0·39	0·41				
	Set	—	—	—	none	0·04	0·12	0·20	0·26	0·33	0·36				Broke in the screw Fracture: Silky fibrous
JK = 15″	Opening out	zero	none	0·02	0·03	0·04	0·06	0·08	0·11	0·13	0·15				
	Set	—	—	—	—	—	—	—	none	0·02	0·04	108·30	72·9	20·0	
LM = 15″	Opening out	zero	—	—	none	0·02	0·04	0·06	0·08	0·10	0·10				
	Set	—	—	—	—	—	—	—	—	—	none				
NO = 8″	Extension	zero	—	—	—	none	0·02	0·04	0·07	0·09	0·12				
	Set	—	—	—	—	—	—	none	0·04	0·06	0·09				
PQ = 10″	Extension	zero	—	—	none	0·02	0·02	0·04	0·06	0·08	0·08				
	Set	—	—	—	—	—	none	0·02	0·04	0·06	0·06				
ST = 32″	Extension	zero	0·03	0·06	0·09	0·11	0·16	0·21	0·30	0·35	0·40				
	Set	—	—	—	—	—	none	0·03	0·10	0·14	0·20				

The above are the results of a pulling test applied to one screw coupling weighing 43½ lb. Gauge points were marked on the coupling at AB, CD, EF, JK, LM, NO. PQ and ST, and the movement of these points was noted as the load was gradually increased. After certain loads had been applied the hydraulic pressure was released and any permanent set noted

Railway axles in nickel-molybdenum steel

chromium-molybdenum steel screw coupling showing the movement and set when subjected to varying loads. The composition of the steel in question was as follows:—

	Per cent.
Carbon	0·36
Silicon	0·23
Manganese	0·36
Sulphur	0·012
Phosphorus	0·017
Nickel	3·5
Chromium	0·67
Molybdenum	0·22

The steel was hardened and tempered to produce a maximum stress of 62 to 72 tons per sq. in., with an elongation per cent. on 2 in. of 20 to 15, and a yield ratio of 85 per cent. For those who prefer the knuckle type of coupling, a nickel-chromium steel casting is most suitable, since it provides, after a simple normalising operation, a moderately high tensile strength, together with good ductility. For example, the Chicago Steel Foundry Company has developed a steel known as Evansteel, of which the following composition is typical:—

	Per cent.
Carbon	0·3 to 0·4
Nickel	1·0 ,, 1·5
Chromium	0·75 ,, 0·95

This is used for the knuckles of Pullman cars, and the following properties are obtained:—

Yield point, tons per sq. in.	27 to 31
Maximum stress, tons per sq. in.	42 ,, 51
Elongation, per cent.	24
Reduction of area, per cent.	35 to 45

In bending tests which were carried out on the actual components it was found that the nickel-chromium steel knuckle had a deflection of 0·68 in. at a load of 29·5 tons, whereas a carbon steel knuckle casting had a deflection of 0·7 in. at a load of 23 tons; the respective weights of the nickel-chromium and carbon steel castings were 25 and 29 lb.

Miscellaneous.—Whilst with modern fast trains very large saving in weight may not be desirable, owing to the better riding comfort which is obtained with heavier coaches, it is more than probable that in the near future, when very high speeds are the rule rather than the exception, greater attention may have to be paid to decreasing the weight of such trains. In this respect attention may be drawn to the very large saving in weight which can be effected by using corrosion-resisting nickel-chromium steel for the passenger coaches.

Such steels are also being increasingly used for various decorative features as well as for door handles and the like, since, owing to their excellent corrosion-resistance, it is necessary to clean only occasionally by using soap and water, thereby effecting considerable economies in upkeep.

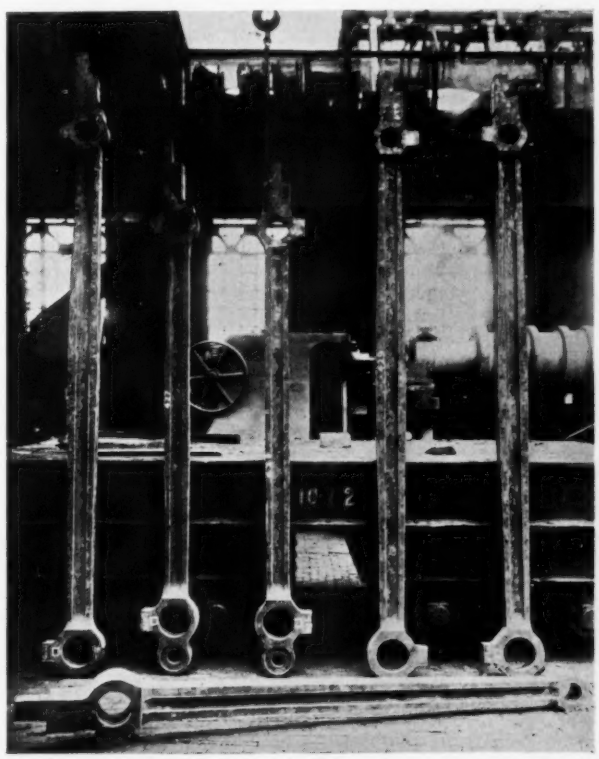
Nickel alloy steel castings have not only been found to be beneficial in the case of the couplings mentioned above, but also in saving weight in the side frames and bolsters of bogies, the use of either nickel-manganese or nickel-chromium steels being favoured for this purpose. Mention may also be made of the beneficial effect which has been found by small additions of nickel of the order of 0·5 to 1·0 per cent. to 1·0 per cent. manganese steel castings, more consistent mechanical properties and better founding properties being secured.

Brief mention may also here be made of the excellent range of nickel alloy steels* which is available for such purposes as the design of transmission gearing of diesel engine cars.

The Demand for Increased Performance

Whilst the whole subject of railway engineering is obviously too extensive to cover adequately within the scope of one publication, it is hoped that sufficient examples have been given to show that nickel alloy steels, by their excellent range of physical properties, will still further enable railway engineers to overcome problems with which they may be faced in the future owing to the general demand for increased performance.

* These steels are referred to in publications AA2, AA4, and A11, issued free by the Bureau of Information on Nickel, Thames House, London, S.W.1.



"Duratlas" nickel-chromium-molybdenum steel connecting rods after heat-treatment

THE CENTRAL STAFF REGISTER OF THE AUSTRIAN FEDERAL RAILWAYS

By Centr. Insp. Dr. FRIEDRICH MAYER,
Superintendent at the Head Office of the Austrian Federal Railways

Fig. 1—A view of the staff register office, showing card index cabinets in background

WHEN, in common with the work of other administrative departments, the recording of particulars relating to staff on the Austrian Federal Railways was centralised, the opportunity was taken to simplify and improve the then existing filing system. Before economic conditions made centralisation important as a measure of economy, the Head Office had concerned itself only with exercising a general supervision, and the local administrations were themselves responsible for staff routine touching all save those in the highest posts. At the present time, however, the Head Office has taken over control of all matters relating to the middle and higher grades of staff, leaving to the local authorities the regulation only of the lower categories. There are 32,000 men under this head, ranging from signalmen, pointsmen, carriage inspectors, and locomotive firemen to workshop artisans, porters at passenger and goods stations, stores department employees, permanent way men, cleaners, and those engaged in clerical work of the simplest kind.

It will be appreciated that a system of filing evolved for local use would not necessarily be adaptable for covering the whole system, and the method of keeping staff records before centralisation was in fact somewhat cumbersome. A record book consisting of up to 30 pages (measuring 13 in. × 8 in.) and known as the *Dienst- und Standes-Ausweis* (Service and Rank Record) was kept for each employee, and this was brought up to date in accordance with the staff reports sent in daily by each executive department. If the Head Office required information regarding the activities of local staff, it could secure it only by applying to the administrations concerned and consulting the records of the employees individually.

Revision of these methods was undertaken two years ago, when a central filing system was evolved at the Head Office as a part of the scheme for centralisation of staff control. The plan adopted is a card index in conjunction with visible indications permitting certain important facts to be seen at a glance, and without consulting the written information tabulated on the cards. The cards are printed and folded in such a way that their upper edge only is normally visible when the drawer of the filing cabinet is opened, and hereon are shown the name and rank of the employee, his branch of service, date of birth and of entering the railway, and so on. To the visible edge

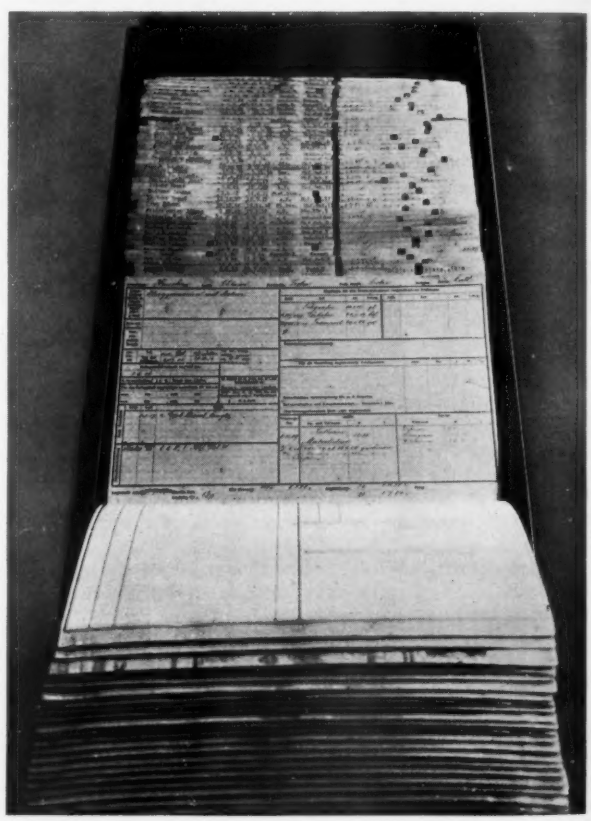


Fig. 2—A drawer of the card index opened for consultation

of the card, too, are fixed tabs which by their colour and position show certain supplementary facts, such as the employee's sex, educational achievements, rank, qualifications for promotion, district of employment, and other details. The edge of the card on which these particulars appear has a transparent protective covering.

The cards may be opened, while still in their drawers, to consult the full information entered upon them, but the system just described makes this unnecessary for certain regular examinations, such as those connected with routine promotions and advances in salary. Formerly, employees falling due for promotion had to be ascertained by an examination every six months of the Service and Rank Records already mentioned. Today the date on

Fig. 3—Clerk at work on the register

which each man is due to be promoted is shown at a glance by the coloured tabs affixed to the upper margin of his card.

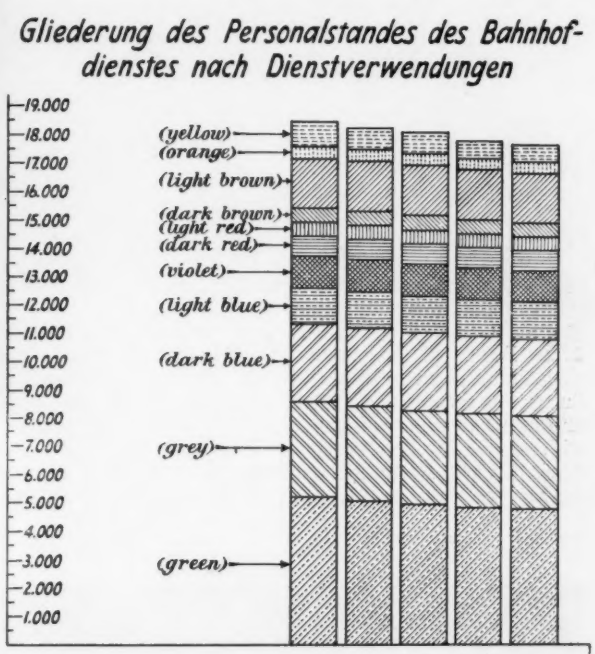
In Fig. 2 is shown a drawer of the index in which the cards at the back are stored in the normal way, with only the information contained on the top edges showing. A few in front have been turned over to permit the additional information on the face of one of the cards to be consulted. Here are tabulated particulars of the employee's education, family, physical fitness, the railway examinations he has sat for and passed, and other matters. When opened, the card provides for a two-page record of the employee's career and progressive remuneration. A space is set aside for entering the number and duration of illnesses. The back of the card is used for recording punishments.

The complete card index covers the 54,000 odd employees of the Austrian Federal Railways so that the records required to be kept by the local administrations of men directly under their control are much simplified. The only employees of whom the index does not take cognisance are seasonal workers engaged in summer. The cabinets in which it is housed (seen in Figs. 1 and 3) are grouped under departments and grades of service, but there is also a general index in book form containing the names of all employees in alphabetical order, and sufficient information to enable the cabinet containing their records to be ascertained at once. Each cabinet contains eight drawers running on rollers and readily withdrawable for making entries on the cards, as shown in the illustrations. A card is never removed from the index while the employee is in the railway service, but written extracts are made when information regarding a man is requested.

All staff matters are under the control of the Secretary General at the Head Office, assisted by departmental superintendents. The filing system itself is in charge of another official, with an assistant who personally supervises all work on the records and the general index by the seventeen clerks in the department, each of whom is responsible on an average for 3,300 records.

One of the most important tasks of the index staff is the settlement of wages and salaries, both as a result of the regular two-yearly increases and of promotions occurring intermediately. Two clerks under the official in charge of the register occupy themselves exclusively with keeping track of these changes, and watch the progressive remuneration of every employee.

To keep the records up to date, reports of staff changes



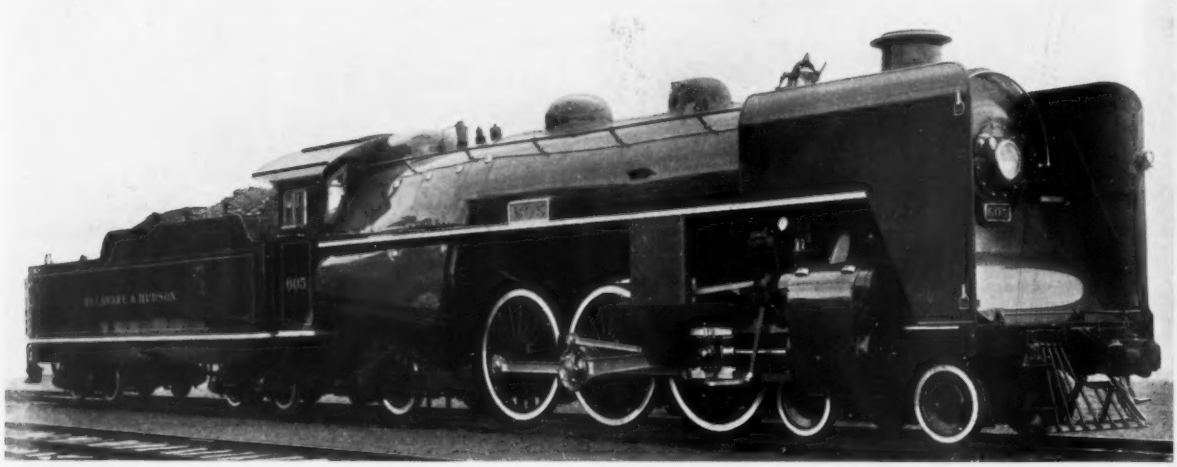
Dienstverwendung			Jänner	Feber	März	April	Mai	Ju
Leitung und Verwaltg.	a) Vorstände, Bahnhofleiter, Bhf. Aufs. ß.	(yellow)	761	767	767	761	761	
	b) Verwaltungsdienst	(orange)	348	350	348	335	324	
Verkehrsdienst	a) Verk-, Aufs; Res; Schul; Erheb; Wag; Foltr.	(light brown)	1.758	1.743	1.719	1.706	1.700	
	b) Fernschreib- u. Fernsprechdienst	(dark brown)	484	463	455	444	451	
	c) Wagenschreibdienst	(light red)	466	460	461	450	434	
	d) Bahnsteigschaffner, Bahnhofwart, Zugsw. u.s.	(dark red)	732	714	735	673	664	
Kommerzieller Dienst	a) Magazin- u. Zolldienst	(violet)	1.169	1.153	1.141	1.066	1.063	
	b) Kassendienst-einschl. Halte- u. Ladest.	(light blue)	1.321	1.337	1.327	1.295	1.298	
Verschubdienst		(dark blue)	2.775	2.754	2.717	2.632	2.627	
Weichen-, Signal-, u. Schrandienst		(grey)	3.446	3.477	3.469	3.521	3.516	
Bahnhelfer, sonst. Bed. Hilfsbedienstete		(green)	5.239	5.230	5.149	4.946	4.917	
Summe:			18.499	18.448	18.288	17.829	17.755	

Fig. 4—Totals and distribution by rank of station staff

are sent in monthly by all sections of the Austrian Federal Railways. These are drawn up on forms printed to tally with the arrangement of the index cards. Changes in the status of employees following action by the staff section at the Head Office itself are likewise noted immediately in the registers. The hours of the staff are arranged so that changes can be recorded at whatever time they are notified. On the first day of every month the total strength of the personnel is determined by means of the index, and recorded graphically. Fig. 4 is a reproduction of one of the wall charts displayed in the records department; it shows the number of employees month by month at stations, both as a whole and in the various grades.

The central staff register has now been established two years, during which time it has fully proved its value. When finance allows, it is hoped to introduce a similar system for keeping records of the staff wholly under the control of the local administrations, and of the executive services.

4-6-2 EXPRESS LOCOMOTIVES WITH ROLLER BEARING RODS



MR. G. S. EDMONDS, Superintendent of Motive Power of the Delaware & Hudson Railroad, has kindly provided us with the photograph we reproduce of the company's latest 4-6-2 locomotive, No. 605, and in a letter he mentions that the engine, which is fitted with S.K.F. roller bearings, has been running since April 30, 1935. Another engine, No. 609, which started working on January 31, 1934, is similarly fitted. In this period of service with the two locomotives there has been only one detention due to the bearings. The operating temperatures run from 35 to 40 degrees above climatic.

The locomotive illustrated is fitted with side deflector plates as in European practice, and there are other features resembling British standards of construction, notably the handsome appearance and clean lines. According to report, the engine is giving very good service results.

New Cinema Coach, L.N.E.R.

The cinema coach, which the L.N.E.R. introduced on the Leeds-Edinburgh service on March 2, embodies a number of improvements on the pioneer London-Leeds vehicle of last year. The second coach, the interior of which is illustrated alongside, is over 60 ft. long and is divided into two sections, one for the audience and the other for projection. There are seats for 52 persons ranged in a double row on each side with the floor of the carriage rising towards the rear. Projection is from the rear; the screen, 4 ft. by 5 ft., is accordingly of frosted glass. A 16 mm. sound projection machine has been installed, as by using a substandard machine it is possible to wind sufficient film on one spool to give an hour's performance and thus obviate the necessity for a second machine. The films are non-inflammable. Ventilation is such that smoking is permitted without inconvenience. The auditorium is decorated in blue and gold. Special materials have been used to reduce train noises to a minimum.

(*See editorial note on page* 725)

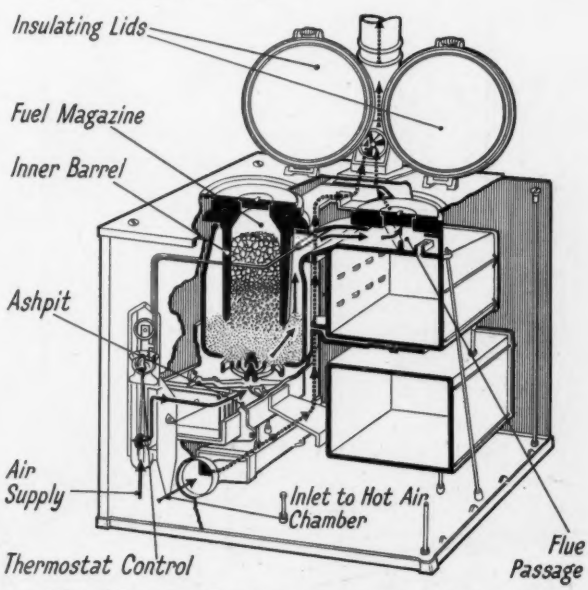
IRISH DINING CAR EXPERIMENTS

THE Great Northern Railway of Ireland is experimenting under the direction of Mr. G. B. Howden, Chief Engineer, with two types of cooking equipment on the restaurant car services between Dublin and Belfast. The first consists of a high-pressure gas installation and the second of an Aga cooker.

Car No. 401, with the gas equipment, has four steel cylinders made by the Chesterfield Tube Co. Ltd., which are charged to 3,000 lb. per sq. in. pressure at the Belfast gasworks, where a special compressing plant has been installed for general purposes. The capacity of the cylinders is 1,600 cu. ft. of free gas compressed to 3,000 lb., and they are located transversely across the car below the underframe. Each cylinder is fitted with a double-seated stop valve and coupling nut at one end and a screwed handle at the other. When the coupling nut is unscrewed and the locking blocks slackened, the cylinders can be withdrawn from the other side, a procedure which is necessary for the daily recharging. When in place the cylinders are connected to a forged steel manifold through non-corrosive steel piping with a bore of 0·125-in., and from the manifold the gas goes to a two-stage governor where its pressure is reduced first to 5 lb. per sq. in. and then to 3·5 in. of water. A 0·75-in. pipe leads from the governor to the cooker and connections are provided for using the low-pressure town mains at intermediate stations should this ever be necessary. All the high-pressure piping is outside the car body. The cooking range was made by R. & A. Main Ltd., of Falkirk, and comprises a roasting oven, a copper boiler, a potato steamer, a grill, a toaster, and a hot closet. The car, which is shown in an accompanying illustration, follows normal G.N.R. (1) standards in its construction.

In the second experiment, Car No. 144 has been equipped with an Aga anthracite cooker. We understand that this is the first in use in the British Isles on railway rolling stock, but the Aga cooker has already been adopted extensively on overseas railways, notably on the Bengal-Nagpur and on the Iraq systems. This car was built at Dundalk in 1919 as a director's inspection saloon and rebuilt as a restaurant car in 1927. Like car No. 401, it is 58 ft. long, 9 ft. 9 in. wide, and has first and second class dining saloons. The weight is 34 tons. Between the two saloons are a kitchen and pantry, and the former contains the Aga cooker and an Ideal boiler with a 30-gal. tank. The principle of the Aga cooker may be seen from the accompanying perspective illustration. It is claimed that the consumption of anthracite is extremely low, and that only one firing is necessary for a return trip between Belfast and Dublin.

Some difficulty was encountered in obtaining a suitable flue layout for the Aga cooker, due to the small amount of headroom and to the necessity of getting a balanced draught arrangement from standstill to 70 m.p.h. The flue is led up to the roof and secured to a Colt flat ventilator with a copper collar packed in asbestos at the joint. After the first run this ventilator was altered to sit transversely, and this, with a butterfly damper located in the flue itself, considerably lowered the draught speed and gave a steady draught.



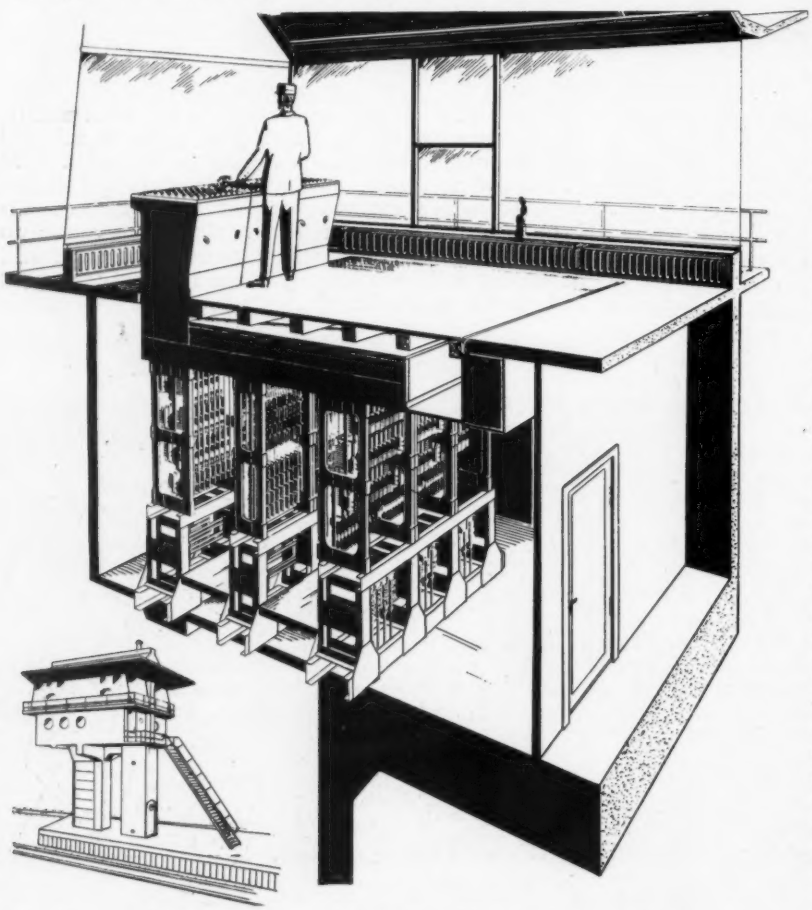
Pictorial section showing arrangement of Aga cooker

POWER SIGNALLING IN HOLLAND

New electric installation at Maastricht

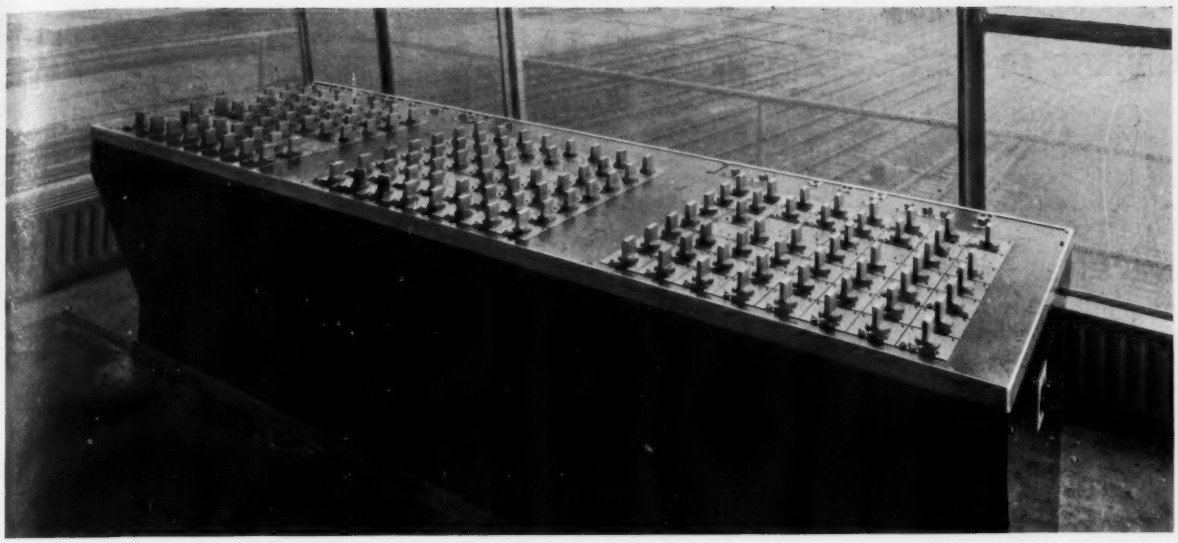
WE have received from Mr. G. J. de Vos van Nederveen Cappel, Chief Signal Engineer of the Netherlands Railways, the accompanying illustrations of an interesting new power signalling installation which was brought into service on March 17 at Maastricht station, an important junction with lines from Belgium and Germany, in the extreme south of the province of Limburg. The station has been re-signalled in order to concentrate the working in a more convenient and economical manner, and the new signal cabin, at the end of the platforms, has taken the place of three mechanical ones. The most interesting feature of the work is the use of an advanced form of multiple row locking frame, enabling no fewer than 168 levers, or handles, inclusive of 15 spare spaces, to be concentrated in a frame occupying a space of only 8 ft. 10 in. by 3 ft. 0 in. The idea of using several rows of levers in power frames has long been known, but it has lately received particular attention in Germany owing to the necessity of economising in signalling expenses. Several multiple row frames have been installed by the Reichsbahn in the last few years, with the handles arranged in three or four rows one behind the other. In this way it has been possible to reduce the size of the signal cabin, leading to considerable saving. Cabins have also been placed in positions not otherwise suitable, and the expense of constructing extensive girder work, foundations and other items for frames of conventional type has been eliminated.

New electric signal cabin containing 168 lever frame. The signals with arms vertical are waiting to be brought into use



Arrangement of the operating and control portions of the multiple-row locking frame

The Netherlands Railways have similarly sought to economise by attaining the maximum concentration of levers, especially where at certain hours there is not much traffic and one man can attend to a large number provided they are conveniently within his reach. With this object Mr. Bouman, of the Signal Department of the Netherlands Railways, designed a particularly compact form of multiple row frame in which the handles are arranged in seven rows, back to front, and in groups of 56. The apparatus was constructed by the Vereinigte Eisenbahn - Signalwerke, Berlin-Siemensstadt and has been adopted for Maastricht station. The sketch shows the principles of construction of the frame, which is of the flat desk pattern, 2 ft. 8 in. high; the handles operate vertical spindles acting on mechanical locking mechanism immediately below the floor. On the first floor of the cabin, under the signalman's section, the whole of the electric apparatus is assembled for ready inspection. The lineman can attend to practically every part of the equipment without interfering with the signalman's work. Block instruments are no longer used, the necessary controls being obtained by means of relays, with lamp indicators in the frame. Opposite is a view of the latter, in which its extreme compactness can be seen. There are 153



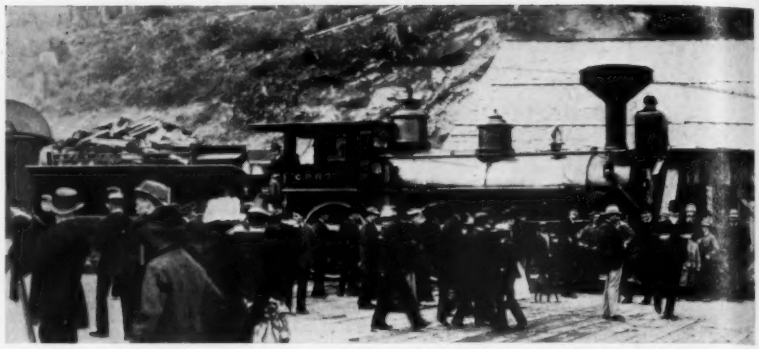
The multiple-row locking frame, with handles arranged in 3 groups of 56 each, equal to 168 levers (15 spare spaces at present)

handles working and 15 blank spaces for future requirements. They control 71 pairs of points and 36 running signals, in connection with a total of 163 running movements and 80 shunt movements, for which certain special signals are provided. There are 18 route handles. An equivalent frame of the pattern used in Holland hitherto would have been 45 ft. long, so that the space saved is very considerable. The use of the flat desk form gives the signalman a very clear view over the lines under his control. The remaining figures show the general features of the work, which represents the latest practice of the Netherlands Railways and will no doubt improve the working at this important junction station, at the same time eliminating a good deal of expense that was inevitable under the old mechanical system.

Interior of signal cabin, with part of frame in foreground. Note doors in floor for access to apparatus and tackle for installing or removing

JUBILEE OF VANCOUVER

(See editorial note on page 726)



Above: Arrival on July 4, 1886, at Port Moody of the first transcontinental passenger train. The C.P.R. lines had met at Craigellachie on November 7, 1885, but work was then suspended during the winter

Left: On the completion of the C.P.R. to Vancouver, 12 miles nearer the ocean than Port Moody, an inaugural run was made from Montreal and reached Vancouver on May 23, 1887, the eve of Queen Victoria's birthday in her Jubilee year

Below: The arrival scene at Vancouver of the first "ocean-to-ocean" train

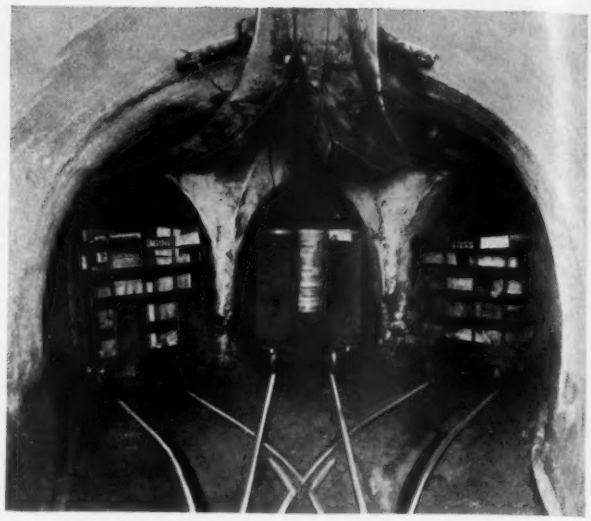
General view of Vancouver today, with the C.P.R. local freight yards in the foreground

C.P.R. station and general offices at Vancouver

Scene at Vancouver station prior to the transcontinental departure

Chicago Underground Freight Railways

The illustrations on this page give a general idea of the underground freight railways of Chicago, which were described on page 531 in THE RAILWAY GAZETTE of October 4, 1935. The many large stores and warehouses served by these lines are reached by tunnels branching off the main lines under the streets, as shown in the first illustration. Firms having no private connections of their own deliver their freight to one of four "universal" tunnel stations, such as shown in the second illustration. In front may be seen the tramways and loading platforms, and above are the railroad tracks. The elevators, or lifts, and tunnel tracks are inside. Coal is loaded into the tunnel cars through chutes from above, and, at its destination, it passes on to conveyors which deliver it to the premises. Freight loading into tunnel cars is done at ground level in railroad freight houses, the cars being lowered to, or raised from the tunnel tracks by elevators.



Typical tunnel junction

A "universal" freight station, showing tramways, loading platform and railroad sidings above

Left: Tunnel cars being loaded with coal through chutes from above. Right: Freight for the tunnels loaded in tunnel cars at an outbound railroad freight house

RAILWAY NEWS SECTION

PERSONAL

The King has granted his patronage to the Railway Convalescent Homes.

As anticipated in THE RAILWAY GAZETTE of March 27, Mr. J. C. Highet, Agent of the North Western Railway, India, has been appointed Member of the Railway Board in place of Mr. Tylden-Pattenson, proceeding on leave. Mr. Highet is succeeded as Agent by Lt.-Col. C. F. Carson, M.C., R.E., formerly a member of the Pope Committee and more recently Deputy Agent (Organisation), N.W.R. Lt.-Col. R. E. Gordon, M.C., R.E., succeeds Col. Carson in the latter position.

Mr. John Lea is retiring from the position of Divisional Superintendent, Swansea, G.W.R., on May 4.

Mr. F. E. Rebbeck, Chairman and Managing Director of Harland & Wolff Limited; Mr. H. Yates, Managing Director of Smith & McLean, Limited; and Mr. T. R. Craig have been appointed Directors of Colvilles Limited.

Mr. C. Hamilton-Swanzy has been elected Chairman of the Liverpool branch of the Industrial Transport Association, of which he was a foundation member and first secretary. He was at one time on the former Midland Railway, and is the originator of a tube scheme for Liverpool. Mr. Peet Robinson has been elected Honorary Secretary.

We regret to record the death of the Marques Alonso Martinez, Chairman of the Northern of Spain Railway. He was also Chairman of the Central Aragon and Portugalete Bilbao Railways.

INSTITUTE OF TRANSPORT

The following member and associate members have been elected during the months of February and March:—

Member

Mr. George Henry Loftus Allen, Advertising and Publicity Officer, L.M.S.R.

Associate Members

Messrs. C. R. Grant, L.P.T.B., and C. A. Baines, Port of London Authority.

Mr. G. V. O. Bulkeley, C.B.E., M.I.Mech.E., who as anticipated in THE RAILWAY GAZETTE of March 27, has been appointed Director of Transport in Nigeria, will assume his new responsibilities on his return to that colony. Under the new organisation the Director of Transport will assume executive control of the Government Railway, Ports and Marine services; the General Manager of the Railway, the Ports Traffic Superintendents and the Superintendent of Marine reporting directly to him. Port Advisory Boards are to be established at Lagos and Port Harcourt. A further co-ordination of rail, port, road, river, and air transport matters is under consideration.

Photo by [*Lafayette*

Mr. G. V. O. Bulkeley, C.B.E.,
Appointed Director of Transport in Nigeria

Mr. Bulkeley comes of a Great Western Railway family, his relative, the late Captain Thomas Bulkeley, having been a Director in the early days of the company. He is the son of the late Rev. O. T. Bulkeley and was educated at Victoria College, Jersey, and Manchester University. He served his training in the locomotive workshops of the Great Western Railway at Swindon, afterwards being attached to the staff of the Divisional Locomotive Superintendent at Wolverhampton. He then went to the Far East, where he was associated with the railway supply and machinery business in Japan and China. Mr. Bulkeley later joined the staff of the Superintendent of Motive Power of the Canadian Pacific Railway, and afterwards became associated with marine business on the Pacific Coast of Canada. During the war he was employed in connection with road transport and the repair of Army Service Corps vehicles in the shops of the Great Western Railway; also acting in an advisory capacity to the Board of Fisheries. In 1919 he was appointed to the personal staff of the General Manager of the Great Western Railway, and, in 1921, took temporary charge of that company's offices in New York and Toronto. In 1922 he was attached to the personal staff of the Chief Docks Manager at Cardiff, and in 1923 accompanied a railway and port commission to Canada and the United States of America. Mr. Bulkeley was later appointed Docks Traffic Superintendent at Swansea, when the G.W.R. acquired that port. In 1926 he was appointed by the Secretary of State for the Colonies to the new post of Port Manager, Kenya & Uganda Railways & Harbours, with headquarters at Mombasa—where port development works, at a cost of some three and a half million pounds sterling, were completed in 1931—his duties there including supervision of the railway Coast District. Mr Bulkeley received the honour of C.B.E. in the 1932 New Year honours list, and in the spring of 1933 was appointed General Manager of the Nigerian Railway, the post he now relinquishes. He is a Member of the Institution of Mechanical Engineers and is the author of two books upon transport matters: "Mechanical Appliances for Handling Railway Traffic" (1922), and "Railway and Seaport Freight Movement" (1930).

ARGENTINE RETIREMENTS

In connection with the retirements of Messrs. Stuart and Roberts from the positions of Commercial and Technical General Managers respectively, of the Buenos Ayres Great Southern and Western Railways, there were several important valedictory functions in the Argentine capital. (Their portraits and

A new series of posters issued by the L.N.E.R. illustrates popular East Coast resorts, and is arranged either to form a consecutive massed display in the striking manner shown above or to be used individually (see news article opposite)

Left to right: Messrs. M. F. Ryan (B.A.P.), Ronald Leslie (Central Argentine), L. Cocagne (Cia. Gen. de la Prov. de Buenos Aires), C. A. Roberts, D. M. MacRae (Córdoba Central), C. R. S. Harris (B.A.G.S. and B.A.W. Railways), C. P. Billings (B.A. Central) and G. Meuton (Rosario-Puerto Belgrano)

Farewell dinner given by the Argentine Railway Managers at the Jockey Club, Buenos Aires, to Mr. C. A. Roberts, the retiring Technical General Manager, B.A.G.S. and B.A. Western Railways

Seated left to right: Mr. C. A. Roberts, Sir Hilary H. Leng, K.B.E., and Dr. G. E. Leguizamon. In the centre behind Dr. Leguizamon is Mr. C. R. S. Harris and with Mr. R. Stuart on his right and Mr. J. C. Angel on the left

Luncheon given at the Jockey Club, Buenos Aires, by the officials of the B.A.G.S., B.A. Western and B.A. Midland Railways, to Messrs. R. Stuart and C. A. Roberts

biographies were published in our issue of March 13 last).

On March 27, they were entertained to luncheon at the Jockey Club by Dr. G. E. Leguizamon, Chairman of the Local Boards, B.A.G.S. & B.A.W. Railways, Mr. C. R. S. Harris, Director-General of both railways, and Mr. J. C. Angel, Local Director, to which function Sir Hilary Leng, K.B.E., Local Director, B.A.W.R., the executive officers and higher officials of the two railways were also invited. On behalf of those present, Dr. Leguizamon presented Messrs. Stuart and Roberts with handsome silver salvers, suitably inscribed, and bearing the autographs of the donors. In a short speech, Dr. Leguizamon referred to the long and meritorious record of distinguished railway service from which they were both now retiring to enjoy a well-earned rest. He said that many years of daily association in the same sphere of work had created bonds of affection and happy memories which, despite separation, would be indissoluble. Their colleagues felt that they could not let them go without telling them how deeply they felt the parting, and wishing them both long life and every happiness. Dr. Leguizamon then asked them to accept the salvers, on which the names of those present were inscribed, as tokens of high appreciation and enduring esteem. Suitable replies were made by both. Those present were:—

Messrs. R. Stuart and C. A. Roberts; Dr. G. E. Leguizamon, Sir Hilary Leng, K.B.E.; Messrs. C. R. S. Harris and J. C. Angel; Doctors A. Sanchez and R. Bullrich; Messrs. G. A. White, E. Meynell, F. P. Oliver, F. E. A. Rowell, C. Gerez, H. E. Moffatt, P. W. Dobson, F. Baillie, E. R. Sanders, O. Steven, R. M. Langridge, E. Lawrence, E. C. Angel, W. G. Frend, J. A. Trench, S. A. Allerton, T. B. Stewart, H. N. Anderson, H. F. Jung, C. A. Hadcock, F. L. Creswell, J. G. Duncan, W. R. J. Murray, T. H. Baillie, J. W. H. Rea, F. Gee, R. Wright, J. Wilson, G. E. Brown, E. A. Steele, G. R. Mawson, R. Montgomery.

On March 30, Mr. Roberts was entertained by the General Managers of the Argentine railways at a dinner at the Jockey Club, at which the following were present:—

Messrs. Ronald Leslie (Central Argentine), M. F. Ryan (B.A. & Pacific), C. A. Roberts and D. M. MacRae (Cordoba Central), C. R. S. Harris (B.A.G.S. and B.A.W.R.), C. P. Billings (B.A. Central), L. Cocagne (Cia General Provincia de Buenos Aires), and G. Meuton (Rosario-Puerto Belgrano).

On April 2, Mr. Roberts was also entertained to a farewell luncheon given by the chief officers and heads of departments of the Midland Railway, of which he had been General Manager since 1931; and was the recipient of a similar demonstration of esteem from the administrative staff of the B.A. Western Railway, when he was presented with another silver salver, with a suitable inscription.

On March 31, Mr. John Wilson, O.B.E., who has been appointed General Manager of the Entre Rios & N.E. Argentine Railways, was entertained by the principal members of the staff of the Traffic Department of the B.A.G.S. and B.A.W. Railways—of which he has until now been chief—at a farewell reception in the restaurant of Plaza Constitution terminus, Buenos Aires. Mr. Wilson was presented with a gold cigarette case, suitably inscribed, a gold pencil and a leather wallet, which were handed to him by Mr. G. E. Brown, Assistant to the Traffic Manager, as tokens of esteem and goodwill from those present. Mr. Wilson subsequently entertained the senior members of the traffic staff at a cocktail party, which was attended by Messrs. R. Stuart (retiring General Manager) and T. B. Stewart (the new Traffic Manager), when the latter was introduced to those present in his new capacity. (See illustrations opposite).

M. Félix Fredault, formerly Secretary General of the Paris-Orleans Railway Company, was elected as an *Administrateur*, or member of the board, in succession to the late M. Jules Cambon, at the annual Meeting of the shareholders on March 31. M. Fredault, who has been associated with the company for 28 years, will continue in charge of relations with the press, in which capacity he has won high esteem.

Mr. T. C. Thompson, Traffic Manager of the Taltal Railway, has been appointed General Manager of that system as from March 1.

Mr. J. Calder Angel, Local Director, Buenos Ayres Western and B.A. Midland Railways, has been appointed a Local Director of the B.A. Great Southern Railway, as from April 1.

INDIAN RAILWAY STAFF CHANGES

Mr. E. H. N. Lowther has been appointed to officiate as Deputy Agent, Personnel, E.I.R., as from March 8.

Mr. E. A. Sims has been appointed Member and Secretary of the Railway Rates Advisory Committee, as from March 1.

L.N.E.R. Poster Art

The railway poster is designed to appeal to the individual, and a successful poster campaign must therefore be as varied as the public taste itself. This principle was well exemplified in this year's private exhibition of new L.N.E.R. posters, held at Marylebone station. Another noteworthy feature was the increasing tendency to "speak pictorially." Even when advertising special facilities, an effort was made to lead the attention to the explanatory text by way of an intriguing illustration.

Scotland is always a source of inspiration to the artist, and so it was not surprising that the three most artistically attractive posters were of Scottish subjects. Highland hearts will leap at Miss Zinkeisen's "Rob Roy," standing boldly, with his sturdy figure braced against the driving rain. More serene, but equally characteristic of the Highlands, is Mr. E. W. Hazlehurst's outstandingly beautiful landscape of Loch Long. For the reproduction of this the printer also deserves a special word of praise. Yet another aspect of Scottish scenery is impressively portrayed by Mr. Sidney Lee, R.A., in his poster of "Royal Deeside." A grey, weather-worn bridge in the foreground stands out superbly before a range of mountains bathed in a delicate blue light. The conservatism of treatment characteristic both of Mr. Hazlehurst and Mr. Lee is admirably suited to these Scottish scenes.

For well-conceived originality, however, six "new angle" posters of East Coast resorts by Mr. Tom Purvis are outstanding. Used together, this series, which includes the principal seaside towns of England's "drier side," forms a continuous coastline (though the pedantic may ask where is the Wash). Mr. Purvis has made a most acceptable contribution to the art of poster design. So far as the posters of the other coastal holiday resorts are concerned, the bathing belle seems as popular as ever, and judging by her domination and even obliteration of the scene, her company would in most cases appear to be the principal attraction offered.

Rich in cathedrals and ancient monuments, the L.N.E.R. territory, as usual, provides inspiration for a number of fine posters of historical and archæological interest. This year Mr. Fred Taylor makes York Minster the background for a succession of gorgeous scarlet uniforms, and the Chapel of the Thistle at Edinburgh a somewhat sombre setting for a herald's tabard. Less conventional is a series of simple woodcuts of Ely, Cambridge, York, Lincoln, and East Anglia. While most attractive when used for book illustration, this form of reproduction appears to lose its intriguing qualities when magnified to poster size. A more successful experiment is the use of photographs in two posters dealing with the pleasures of the "Northern Belle" cruising train, and the amenities of the enlarged Royal Station Hotel, Hull.

One of the brightest posters of all was "Dresden." The artist, Mr. Fred Taylor, who always reproduces the elusive colour values of architectural subjects with extraordinary fidelity, shows once again his genius for imparting the atmosphere of leisure so essential to the successful interpretation of a period scene. There were also two other posters to remind one of the importance of Harwich as a gateway to the Continent. A very effective night scene in which an L.N.E.R. steamer lay ghost-like in moonlit Dutch waters was one, and the other, more ordinary in its conception, was entitled "The Belgian Coast."

The Problem of Railway Charges

Report of a paper read by Mr. W. V. Wood, a Vice-President, L.M.S.R., before the Institute of Transport on April 6

Railway charges in Great Britain, said Mr. Wood, were now regulated mainly by the Railways Act of 1921. This Act, by its control of profits from all sources, covered not only charges for purely railway services and for other services within the scope of the railway undertakings, but also all other business carried on by the railway companies, including (by recent Acts) road and air transport. Inside this overall regulation aimed—unnecessarily at the moment—at restricting railway profits, there were four main classes of charges: (1) Railway transport, including terminal services; (2) other railway services; (3) dock, &c., charges regulated by special Act of Parliament; and (4) other charges. Group (2) consisted principally of services such as those in connection with private sidings, collection and delivery, weighing, use of coal drops, and other services rendered or accommodation provided. Such charges had to be reasonable, and an aggrieved trader had a right of appeal to the Railway Rates Tribunal. Generally speaking, the test of reasonableness was whether the all-in cost plus an addition for profit, risks, and contingencies, justified the charge. Group (3) covered the many cases where maximum charges were prescribed by separate Acts of Parliament, sometimes with powers of review by a Court or by the Ministry of Transport. In the case of shipment coal, however, cost plus profit was not the sole test applied to determine the propriety of the charge. Regard was also had to charges at other ports and to that elusive thing known as "the national interest." In 1929, for example, the Statutory Committee dealing with railway dock charges recommended that certain charges for shipment coal which were below the actual cost without any addition for general charges, interest or profit, should not be increased because of the effect on the trade concerned, and the Minister of Transport confirmed the existing charge.

Railway companies' charges were all inter-related when standard charges were fixed or modified, but no such modification had taken place since the first fixation (as from January 1, 1928). Despite the inadequacy of net revenues the companies had not, so far, proposed any modification of railway charges for the high classified traffics, as this would have been rendered nugatory by road competition, while modification of charges for the low classified traffics had not been proposed owing to the difficulties of the trades concerned.

Early Scales of Charges

To get a proper perspective as to the first group of purely railway charges it was necessary to look back to the early history of railway charges. The Surrey Iron Railway, which was opened in 1803, was the first railway constructed for public use, and Parliament, in regulating its tolls, settled its maximum charging powers on a classified basis following the principle adopted by it for canals. This permitted maximum tolls varying from 2d. to 6d. per ton per mile for the use of the railway line. The actual charges made from June 1, 1804, had survived in the form of a toll sheet now preserved in the Science Museum, South Kensington. In the case of the Stockton & Darlington Railway there was a further refinement in classification which differentiated between coal for shipment and for land sale. The Liverpool & Manchester Railway was required to convey both passengers and merchandise, and a further scale was introduced on it of maximum rates for carriage (inclusive of tolls) with the exception of "persons, cattle and other animals," the charges authorised for these being reasonable amounts to be determined by the company. A provision was also inserted that when a dividend on shares exceeded 10 per cent., the maximum tonnage rates chargeable were to be reduced in the following year by 5 per cent. for each £1 paid in dividend in excess of £10 per share (£100). They had thus in these three Acts the origin of railway charges as they now knew them: (1) the toll per mile on a classified basis inherited from the canals, (2) the carriage charge inclusive of tolls, (3) the obligation to carry, and (4) the interplay of restricted profits on charging powers. All these elements were inherent in the present charges, along with terminals and collection and delivery charges for merchandise. Terminals were sometimes mentioned and sometimes ignored in the earlier Acts, but the Surrey Iron Company's toll sheet indicated that they were charged in 1804. Parliament decided in 1840 that the railways should not be prohibited from performing collection and delivery.

Limited Freedom within Maxima

During the period between the reigns of George IV and George V the railways developed from mere owners of a means of transport into carriers providing a comprehensive transport service by rail with connecting sea and road services. Down to the middle of last century it could broadly be said that, subject to their maximum charging powers and regulation of profits, the railway companies were left to conduct their businesses with their customers as they thought fit. This was modified by the direction of Parliament in 1845 that charges in like circumstances should be equal to all persons and without direct or indirect favour of any railway user; and by the further direction of Parliament in 1854, to afford reasonable and equal facilities without undue discrimination to all persons and traffics and to provide through facilities and through rates between the various railways.

The Railway and Canal Traffic Act, 1888, required a general reclassification and a revision of all maximum rates, after enquiry by the Board of Trade. The new scheme produced by the Board of Trade provided for a uniform classification divided into eight classes, with terminals under five descriptions, and conveyance rates per ton-mile scaled downwards according to distance. The scheme was enacted in 1891 and 1892 as the new maximum scale to be applied on January 1, 1893. The task of revision was huge, as millions of rates required to be examined, but extension of time was refused, and the companies had no option in the time available but to apply the scale as it stood and charge the rates newly authorised pending particular adjustments downwards to meet trade conditions. Those traders who gained were not displeased; those who lost were aggrieved, and Parliament quickly intervened and passed an Act in 1894 which provided that if a rate were increased after December 31,

SURREY
Iron Railway.

The COMMITTEE of the SURREY IRON RAILWAY COMPANY,

HEREBY, GIVE NOTICE, That the BASON at *Wandsworth*, and the Railway therefrom up to *Croydon* and *Carshalton*, is now open for the Use of the Public, on Payment of the following Tolls, *viz.*

For all Coals entering into or going out of their Bason at Wandsworth,	*per Chaldron,*	3d.
For all other Goods entering into or going out of their Bason at Wandsworth - -	*per Ton,*	3d.

For all GOODS carried on the said RAILWAY, as follows, viz.

For Dung, - -	*per Ton, per Mile,*	1d.
For Lime, and all Manures, (except Dung,) Lime-stone, Chalk, Clay, Breeze, Ashes, Sand, Bricks, Stone, Flints, and Fuller's Earth,	*per Ton, per Mile,*	2d.
For Coals, - -	*per Chald. per Mile,*	3d.
And, For all other Goods, -	*per Ton, per Mile,*	3d.

By ORDER of the COMMITTEE.

Wandsworth, June 1, 1804

W. B. LUTTLY,
Clerk of the Company.

BROOKE, PRINTER, No. 25, PATERNOSTER-ROW, LONDON.

The 1804 toll sheet of the Surrey Iron Railway

1892, a trader affected could appeal to the Railway and Canal Commissioners, and in that event the onus of justifying that the increase was reasonable lay on the company. The new scale thus went by the board (except where it reduced a rate), and the effective maximum, when a rate was not reduced by the new scale, was the rate which happened to be on the books at December 31, 1892, unless the company could prove a change in the net circumstances affecting the particular rate—a burden truly described in the Courts at the time as " most terrific." In 1913 the law was amended to permit the Courts to sanction increases due to higher costs of labour generally, without proof relating to particular rates, thus relieving the companies from the severe burden of elaborate apportionments between traffics. As a result, merchandise rates other than coal were increased by 4 per cent. from July 1, 1913, provided the maximum was not thereby exceeded, the average increase owing to this being 2·6 per cent. on merchandise (other than coal) carried at exceptional rates. In effect coal rates had earlier been increased by charging 20 cwt. instead of 21 cwt. a ton (net). Merchandise carried by passenger trains in consignments up to 500 lb. was usually free from any maximum charge limitation until 1893, when perishable traffic was brought into the new scales.

The period of Government possession in consequence of the war lasted from August, 1914, to August, 1921. Towards the end of this period there were various percentage additions to the rates and charges in force in 1914 in order to adjust them to new cost and price levels. These additions were not on a uniform scale, but aimed at easing the relative position of the heavy industries and agriculture. Between 1921 and 1923 the percentages were revised downwards in stages, followed, however, by an increase in 1927, the series of emergency changes then ending with percentage additions of 50 or 60 per cent. over 1914 rates plus flat additions of 2d. to 6d. a ton, subject to maximum additions of 1s. 6d. to 8s. a ton. These represented a then overall increase of about 63 per cent. in rates over the actual levels of 1914, passenger fares being about 50 per cent. higher.

Standard Charges

From January 1, 1928, when the Railways Act of 1921 came into force so far as it related to charges, the system of maximum charging powers was swept away, there being substituted a control of charges by fixation of a standard revenue or profit (before remuneration of debenture capital) which the charges should aim at earning, regard being had to all sources of revenue and not only that from railway charges. The actual fixation was confined to standard charges, but the Act recognised that there would be many downward exceptions known as exceptional rates and fares. In effect, the standard revenue, up to the present time, had been a simple limitation of profits at a level not yet reached by any company. The basic standard charges subject to exceptional rates as important as themselves were the offspring of prolonged inquiries first by the Railway Rates Advisory Committee, which, in the years 1920 to 1923, made a brand new classification much more comprehensive than that of 1893, and embracing all merchandise by freight and passenger trains; and secondly by the Railway Rates Tribunal which fixed new standard scales of merchandise charges under each of 21 classes, apart from coal, and also standard passenger fares, together with fares for workmen and season and traders' tickets.

Exceptional Rates

It was the general intention of the Act that the old class rates should be replaced by the new standard charges, and that in the process a large proportion of the exceptional rates would be swept away. Mr. Pike stated, when he dealt with rate making in a lecture before the Institute in October, 1929, that there were up to 80,000,000 exceptional rates on the books of the companies at the end of 1927, and that the elimination of dead rates permitted by the Act and the cancellation of those displaced by lower standard charges reduced the number in 1928 to about 5,000,000. Since 1927 the new exceptional rates quoted numbered about 1,000,000. Worthy of mention were the provisions of the Act under which a through journey over two or more railways was treated as one in applying the mileage scales for standard charges, and, in calculating the mileage the shortest working distance was adopted. This in many cases made the new standard charges lower than the previous exceptional rates, and making allowance for all of these factors the rates as a whole on goods train traffic as at January 1, 1928, were about 55 per cent. greater than those of 1914, a percentage which had since fallen. He had recently compared at random half-a-dozen land-sale and shipment coal rates with the standard charges. Taking standard charges at 100, the land-sale coal charges averaged 80 and the shipment coal charges 63. A loss of long distance coal traffic owing, say, to diversion to sea, would reduce the average rate per ton but throw up the average rate per ton-mile on all coal; while a transfer of the destiny of coal from shipment to land-sale purposes might throw up both the average rate per ton and the average rate per ton-mile. Yet with these and other cross-currents there were people who would persist in comparing average receipts per ton or per ton-mile for unlike services and deduce from the arithmetical differences the most specious arguments.

The Railways Act of 1921 tightened the control of rate making and quotation at a time when the development of road charges on simple commercial lines was proceeding rapidly. While dead rates were swept away, those of live value were continued, unless lowered, with perpetuation of all the anomalies resulting from the varying maximum charges, such as (1) the special terms enacted to meet local circumstances 50 to 100 years ago; (2) the special terms enacted because the construction of a railway interfered with the traffic of an existing means of transport; and (3) the normal exceptional rates quoted prior to 1893, some of which were a result of railway rivalries and some due to railway enterprise in creating new industries or new locations for them. Post-war legislation had, in fact, extended and not reduced the control of railway rates.

The Local Government Act of 1929 completely exempted agricultural holdings from local rates and relieved industrial hereditaments such as factories, mines, and railways from 75 per cent. of their local rates. Agricultural and industrial de-rating was a simple relief of production costs but railway de-rating relief, including that on its factories, was transferred to the Railway Rates Tribunal, to use, on terms laid down by Parliament, for the benefit of the coal, iron, steel, and agricultural industries.

Publicity in Railway Charges

The legislation relating to agreed charges, or flat rates, had been described by a road transport organisation as a power to the railways to adjust rates at their own discretion. In fact each charge must be advertised and submitted to the Railway Rates Tribunal in open Court within seven days of the agreement with the trader concerned, at a cost of about £10 per agreement for advertising alone. So far 261 agreed charges had been approved, practically all of them without objection, but each renewal required approval in open Court.

Not only were all proceedings of the Railway Rates Tribunal advertised and held in open Court but a verbatim shorthand report of each day's proceedings was published by the Stationery Office. There were also the elaborate statistics of railway operations, &c., which were published monthly and annually by the Ministry of Transport. The item " Expenses of Rates Tribunal " in the railway accounts referred only to the payments to it for its net expenses; those incurred by the railway companies in advertising, compilation of statistics, legal charges, &c., were charged to the other appropriate items of expenditure. The publicity thus given had other than expenditure reactions on the railway companies as, apart from this publicity to one side of a highly competitive business, some traders with keen competitors had withdrawn from proposals for reduced charges to meet their circumstances when they realised the publicity which would be given to their business arrangements owing to the machinery

for approval of the proposals. With this unique procedure, the railways were recently described by a road haulier as working behind closed doors!

He often read statements that railway rates were peculiar in that they were charged on the basis of what the traffic would bear, but nothing could be further from the facts, as the railways were unique in not being permitted to charge on that basis and non-discrimination between traders alone prevented this. No rate or price for any goods or service could continue to be more than the traffic (or purchaser) could bear, but State control could, and did in regard to railway rates, ensure that many rates were below that level.

Equality Needed for all Transport

There was no logical justification for the present system under which railway rates were publicly controlled and rates on the public roads were not. If Parliament required continuance of the traditional national control of the conduct of railway transport it could not, with equity, require it at the expense of railway owners. If the national interest required the continuance of the present controls of railway merchandise transport, with or without modification, the only clear course was like controls of other forms of transport. He was aware of the difficulties which that presented, including the fact that only the railways catered for all classes of traffic without discrimination, but the difficulties were not greater than those created by the events since the war which unjustly penalised one section of the community—the railway owners. The difficulties included the position of certain vehicles conveying traders' own merchandise. The bulk of these vehicles were used for normal delivery work in a fairly small radius, but vehicles used for long distance work required separate consideration, in order to prevent "creaming," if public transport agencies were regulated in regard to services and subjected to classified rates. Alternatively, those who used such vehicles for the "cream" of their traffic had no equitable right to the benefit of the class charges for the rest of their traffic, and throw the most costly part of their transport on to the public transport organisation. If, on the other hand, the national interest required the continuance, with or without modification, of the present almost complete absence of control of non-rail merchandise transport in the conduct of its business, the equally clear alternative course was again the application of like freedom from controls to railway transport.

In his view all public services which by their nature were monopolistic must, to safeguard the national interest, come under some control in regard to their charges, profits, and services, but there was no justification for such control being applied to one form of transport only. Complete equality, with all it entailed, was the only logical conclusion.

MINISTRY OF TRANSPORT ACCIDENT REPORT

Shrivenham, Great Western Railway: January 15, 1936

On January 15 last the 9.0 p.m. up express from Penzance to Paddington, travelling at 50 to 60 m.p.h. under clear signals, collided with a brake van and 5 wagons, the rear portion of the 10.30 a.m. up special mineral train, Aberdare to Old Oak Common, which had become divided through the breakage of a drawhook. There were about 100 passengers in the express, one of whom was killed, and Driver E. A. Starr was fatally injured. Ten passengers were seriously injured, 17 others and Fireman J. H. Cozens suffering minor injuries and shock. It was a dark cold night and the evidence with regard to visibility in the neighbourhood of Shrivenham varied considerably, owing to low-lying patchy mist, steam and smoke. The inquiry into the accident was held by Lt.-Col. A. H. L. Mount, whose report and conclusions are here summarised.

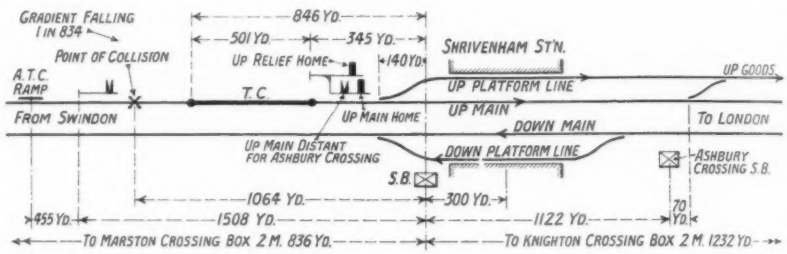


Diagram showing lines and signals at scene of accident

The mineral train was hauled by a 2-8-0 engine which with its 6-wheeled tender weighed 108 tons in working order. It was fitted with vacuum brake on all coupled and tender wheels. The train comprised 53 loaded coal wagons with a 24-ton 6-wheeled brake van, and weighed about 1,108 tons altogether. Its overall length was 1,109 ft. The division occurred between the 48th and 49th wagons, the rear drawhook of the former having broken. The total weight of the 5 wagons and the brake van was approximately 122 tons.

The express was hauled by 4-6-0 engine No. 6007, *King William* III, with a 6-wheeled tender, fitted with vacuum brake on the coupled and tender wheels; all wheels of the train, comprising 9 bogie coaches were braked, and it was electrically lighted. The total weight was approximately 474 tons. Much of the force of the collision was taken by the frame of the goods brake van; but its wheels and those of the 3 wagons in rear were piled into a heap, into which the engine ploughed its way and turned over. This caused violent stoppage of the express, the shock of which was taken chiefly by the first 2 vehicles, which were destroyed. No telescoping occurred, to which the large diameter buffers appear to have contributed. Some 220 yd. of permanent way in the up and down lines had to be relaid and both were blocked for about 20 hours.

The accompanying diagram shows the lines and signals concerned, with the principal distances from the Shrivenham signal-box. The site of the collision was on a bank, some 13 ft. high, about 72¼ miles from London. The gradient in the up direction falls at 1 in 834 from Highworth junction through Marston crossing and Shrivenham for a distance of about 5 miles. The mineral train became divided at 73 miles 51 ch., where a piece of drawhook (broken through the Gedge slot) of a private owner's wagon was found; the brake van and 5 wagons then travelled until they came to rest 444 yd. in advance of the up distant signal. The station has four tracks; the up platform line joins the up goods line at Ashbury Crossing box, where the mineral train was diverted to allow the express to pass. Shrivenham and Ashbury crossing boxes are mechanical. Track circuit in rear of Shrivenham up home controls the block instrument.

The coal wagon with the broken drawhook was built in 1921 and is now owned by Stephenson Clarke and Associated Companies Limited. It was generally repaired at the Cambrian Wagon Company's works, Cardiff, in September, 1932, and had not been stopped for repairs since. The drawhook which failed was the one fitted when the wagon was built, manufactured by Head Wrightson & Co. Ltd. The fracture was of coarse crystalline appearance, with a slight though not growing flaw at the top. The material was wrought-iron and the dimensions conformed to R. C. H. regulations.

According to Driver D. G. Davis, the mineral train, which left Highworth junction at 5.0 a.m., passed Marston crossing at about 20 m.p.h. Shrivenham up distant was clear, the regulator was closed half-way between it and Ashbury Crossing distant, and speed was reduced by the handbrake to 10 m.p.h. through the station, passed at 5.14 a.m. The loop at Ashbury crossing was entered a minute later, and the train came to a stand at Knighton crossing home signal at 5.25 a.m., where Davis learned of the breakaway, of which he had had no suspicion.

having felt no snatch. Fireman P. T. G. Jenkins confirmed his driver's evidence; he had also looked back at Marston crossing, but not at Ashbury crossing, which Davis did not do either, as it was not customary.

Guard H. E. Chandler was in charge of the mineral train. He last worked over the road four months previously, but said he knew it well enough to work a train. He said he did not see Marston crossing; being engaged in his van with his journal and consulting the service book. Two minutes after realising they were slowing up he noted the time was 5.15 a.m. and when they came to a stand his watch said 5.20. He thought the train was intact and stopped at Shrivenham up home. Looking to see if this was so, he realised it had parted, and an instant later sighted the express. Running back about 75 yd., waving a lamp, he had no time to place detonators, and suggested that the collision took place at 5.23 a.m. He had never before experienced a breakaway or had to protect his train in rear.

Fireman J. H. Cozens, an excellent witness, said the express had had a satisfactory run from Newton Abbot, where he and Driver Starr took over. Visibility was not too clear, but was sufficient not to have fogmen out. Speed was about 50 m.p.h. when the train control bell signal was received 455 yd. in rear of Shrivenham up distant, which he observed was off. Shortly after he noticed tail and side lights ahead and shouted to Driver Starr, who apparently saw them at the same moment, but the latter did not lose his nerve and acted as if it were an ordinary signal. Speed was somewhat reduced before the collision. Guard Rapson gave as 5.25 a.m. the time when he had got out of the wrecked train, and he, a ticket collector and others practically confirmed the fireman's statement. The staff acted efficiently in the emergency. Medical assistance was rendered by six doctors and six nurses. The times already quoted appear to be approximately correct. It was necessary to synchronise the times given by the clocks in the various signal-boxes, between which there were appreciable differences. The conclusion arrived at was that the Highworth Junction, Marston crossing and Knighton crossing clocks were right, Shrivenham clock two minutes slow, and Ashbury crossing clock at least two minutes fast, although the company's officers thought otherwise at first.

Signalman A. C. Bartlett, Marston crossing, received " out of section " for the mineral train, which passed him at 5.8 a.m., at 5.15 a.m., and acceptance for the express at 5.18 a.m. This train passed him four minutes later. " Obstruction danger " was received at 5.37 p.m. Signalman W. Head, Shrivenham, watched the mineral train approaching. A down milk empties train was passing and he looked for its tail signal, turning then to see that of the mineral train, which he imagined he did, after which he gave " train out of section " at 5.15 a.m. He accepted the express at 5.18 a.m., and a minute after he had received " entering section " at 5.22 a.m. he heard a bang, and the up distant lever was badly shaken. He thought cattle were on the line; he could see nothing, but he reversed his down signals, stopping an empty stock train, which had passed the down distant and home at clear but fortunately observed the starting signal at danger. Calculations, and Guard Rapson's evidence, indicated that the collision occurred a minute or two later than the signalman supposed.

Signalman E. F. Jefferies, of Ashbury crossing, diverted the mineral train to the up goods loop, which it entered at 5.15 a.m., but he did not give " train out of section " until three minutes later. It is of importance to note that four minutes still elapsed before the express passed Marston crossing. Jefferies said he was called to the telephone as the mineral train passed, and returning to the window thought he saw a white light which he took to be a side light reversed by the guard. He gave " train out of section," first looking through the short section to Shrivenham and seeing it was empty. Later he received the emergency signal and was informed by Shrivenham that wagons were passing there, and he diverted these to the up avoiding line.

Inspecting Officer's Conclusions

No responsibility rests on Driver Davis or Fireman Jenkins, there being no feature in the operation of the train which contributed to the fracture of the hook. The latter was of standard construction and appears to have conformed to the specification in force when made 15 years ago. The failure was due to the poor shock-resisting property of the material, and having regard to the existence of a small but not growing flaw, low temperature was probably a contributory cause. The flaw could not have been observed under any normal system of examination. There is no reason to doubt that the driver and fireman of the express were on the alert. They received the audible clear signal in their cab and it was probably not until they had passed the distant signal that Driver Starr observed the red lights ahead and realised the danger. He acted with great fortitude before succumbing to his injuries, and was a man with an exceedingly good record.

Calculations do not confirm Guard Chandler's evidence; on the contrary they indicate that he might have had as much as nine minutes for protective action. It is quite clear that his account breaks down in respect of the important time when division occurred. Had this happened, as he suggested, while the train was passing Shrivenham box, the broken drawhook would not have been found two miles in rear of it. In fact he had neither kept a good look-out, nor applied his brake, although he thought the train was being stopped at Shrivenham home. In all the circumstances Chandler's evidence is unacceptable. It seems that the situation dawned on him only just in time to permit him to jump from his van and save his life. On the assumption most favourable to him it is considered he had six minutes in which to take action. A considerable measure of responsibility rests upon him.

Signalman Head was primarily responsible, however, as he failed to observe that the mineral train was incomplete and consequently accepted the express. This serious lapse on the part of a man of long experience can only be the result of momentary lack of care and concentration. To his credit, he realised his mistake promptly and then acted efficiently. The same responsibility rests upon Jefferies. Had he not failed similarly, but warned Head promptly, the latter would have had time to correct his mistake. There was much less excuse for him, and the evidence is not convincing that the telephone conversation he mentioned took place at the time he stated. Both men have good records.

Recommendations

This accident is a reminder of the risks inherent in the failure of coupling apparatus and in the division of goods trains which are not fitted with the continuous brake. The general question was referred to in the report on the Dagenham accident in 1931. Improvement is to be noted in the number of divisions. It was agreed that from March 1, 1934, all new drawhooks and bars must be made, without welds, of steel of 32 to 38 tons tensile, but renewals with parts from stock were permitted to June 30, 1934; this date was extended subsequently to March 31, 1935, and after that all drawgear must be of new design and material. Old drawgear may still be used again, provided it can be altered in certain agreed ways. No repair to mild steel by welding is allowed, only to wrought iron. The question arises whether the general improvement in strength, which is so much desired, will be sufficiently quickly attained, unless actual substitution of the stronger equipment can be carried out before scrapping of old wrought iron and steel equipment becomes inevitable. The desirable time to effect this betterment would be in connection with the seven-yearly overhauls, but at least improvement in the shape of annealing, to maintain or restore the reliability of weaker material, appears called for forthwith. It is recommended that the practicability of some such measures for strengthening wagon drawgear be considered.

Proper observance of block regulations would have prevented the results of this breakaway, the outcome of failure of two signalmen and lack of alertness and zeal on the part of a

guard. Track circuit throughout the section would have ensured immunity, but the circumstances of this case hardly afford strong justification for it. The practice in this country has primarily and rightly been based on the policy of local installation, as the statistics for the five years 1930-1934 confirm. The intermittent automatic train control system had no bearing upon this accident. The lack of synchronisation of the two signal-box clocks at the station has been referred to. The records sometimes indicated an error of as much as four minutes. To maintain a high standard of efficiency, the method of transmission and accuracy of the daily time signal, the conscientious adjustment of clocks, and careful supervision and checking of registers appear points worthy of notice.

The practicability of strengthening Rule 126 (*viii*) by special reference to the importance of looking back while passing signal-boxes might well be considered. Attention has again been drawn to the use by guards of flares and/or Verey lights, as additional means of protecting an obstruction; full consideration was given to these points after the Dinwoodie accident in 1928, the conclusion then being that such equipment was not justified. The circumstances of this accident afford no grounds for thinking that such devices would have had preventive effect.

(*See editorial comment on page* 729)

Model Railway Club Exhibition

It is our annual pleasure to wander round the well-filled stands of the Model Railway Club Exhibition, being held this year from April 14 to 18 at the Central Hall, Westminster. What an easily assimilated education in railway constructional details, principally locomotive, this annual display of the work of amateur railway enthusiasts affords. Here a model of an old locomotive, perhaps in the original colourings and finish, will revive old memories and enthusiasms. There a free lance model may lead us to wonder if such and such a class would have been better in service for such and such a modification, or again, ideas of the future trend in design may be deduced from models of the latest streamliners, whether steam locomotives or diesel trains.

This year's exhibition we believe to be better than ever, in variety and in excellence of workmanship. The method of presentation follows the precedent of recent years, and separate stands display groups of L.M.S.R., L.N.E.R., G.W.R., and Southern models. The older models, of which there appear to be more this time, keep company with the very latest designs, such as the L.M.S.R. taper-boiler engines and the L.N.E.R. *Silver Link*. Trains of modern passenger stock are set alongside examples of the latest developments of the 'eighties and 'nineties.

Much may be learned from a study of the very fine large scale models of French locomotives and rolling stock, including a Nord streamlined diesel train set, permanent way details, station layouts and so on, displayed by the Association Française des Amis de Chemins de Fer, and in some cases the work of French railway apprentices. The various complete working model railways, and the train ferry model, all contribute something to fascinate the visitor, while the younger element can enjoy rides behind a variety of locomotives, none more than about eighteen inches high, running on the track loaned by the Society of Model and Experimental Engineers.

The trade stands show their usual enterprise in catering for every interest of the model railway enthusiast, and this year the customary attraction of the cinema is added to by a series of three lectures by railway experts. Mr. W. A. Willox, Editor of *The Railway Magazine*, on Wednesday lectured on "Continental Railways." Mr. Cecil J. Allen talks on "Train Speeds" tonight (Friday) at 6 p.m., and Mr. J. N. Maskelyne, Editor of *The Model Railway News*, deals with "The Locomotive as a Prototype for Models" at 3.15 p.m. tomorrow (Saturday).

The Honorary Secretary of the Model Railway Club is Mr. J. C. Watts, "Haddington," 85, Wood Vale, N.10.

PROGRESS OF RAILWAY BILLS.—A Select Committee of the House of Commons, under the chairmanship of Sir Richard Meller, has been appointed to begin the hearing on April 22 of a group (F) of six Private Bills, of which the first is the G.W.R. (Additional Powers) Bill. Last in the list is the L.N.E.R. (General Powers) Bill, to which additional provisions relating to Hull have been allowed to be added. This company is also applying for permission to insert a further additional provision to empower it to enter into agreements for the sale and transfer of its Tyne Docks undertaking to the Tyne Improvement Commissioners. The preamble of the L.N.E.R. Draft Provisional Order (Scotland) has been formally approved in Edinburgh. It had at first two opponents whose opposition was withdrawn before the hearing. The main purpose of the Order is to stabilise and continue the company's charging powers in respect of the Edinburgh & Glasgow Union Canal. It also authorises the company to acquire lands to give effect to the arrangement with the Government in so far as it applies to the company's undertaking in Scotland. The Southern Railway Bill was on April 1 reported with amendments from a Select Committee of the House of Commons and now awaits third reading.

British and Irish Railways Stocks and Shares

Stocks	Highest 1935	Lowest 1935	Prices April 15, 1936	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	55½	44½	49½	+1½
5% Con. Prefce. ...	124	108	120½	+1
5% Red.Pref.(1950)	117	106¾	109½	+1
4% Deb.	118½	108	114½	—
4½% Deb. ...	122	110	118½	+1
4½% Deb. ...	129½	118	127½	—
5% Deb.	140¼	130	140½	—
2½% Deb.... ...	82¼	68½	78	+1
5% Rt. Charge ...	137	128	134½	—
5% Cons. Guar. ...	136¾	120½	130½	—
L.M.S.R.				
Ord.	25 5/16	16	23½	+½
4% Prefce. (1923)	58¼	43½	71	+3½
4% Prefce. ...	87½	73½	87	+1½
5% Red.Pref.(1955)	107	97¾	107½	+2
4% Deb.	110¼	99½	110	+1
5% Red.Deb.(1952)	119 11/16	111 5/16	118½	—
4% Guar.... ...	105⅝	95½	105	+½
L.N.E.R.				
5% Pref. Ord. ...	157⅛	81¼	11	+1
Def. Ord.	7 9/16	4¾	5⅝	+⅛
4% First Prefce....	74¾	48	68	+3½
4% Second Prefce.	31⅜	16¼	26	+1½
5% Red.Pref.(1955)	92¼	71	93½	+3
4% First Guar. ...	103 11/16	93	103	+1½
4% Second Guar.	98¾	82½	95½	+2
3% Deb.	86	75	83	+1½
4% Deb.	109¼	98½	108	+½
5% Red.Deb.(1947)	118½	106½	112½	—
4½% Sinking Fund Red. Deb.	112½	108	109½	—
SOUTHERN				
Pref. Ord.... ...	87½	69⅝	95	+1
Def. Ord. ...	25 15/16	16¾	24	—
5% Prefce. ...	124	108¼	121½	+1
5% Red.Pref.(1964)	117¾	109½	118½	—
5% Guar. Prefce.	136½	121½	131½	—
5% Red.Guar.Pref. (1957)	121¼	112½	117½	—
4% Deb.	116¾	107	113½	—
5% Deb.	138	130¼	138½	—
4% Red. Deb. 1962–67	115	106½	115½	—
BELFAST & C.D.				
Ord.	9	4	9	—
FORTH BRIDGE				
4% Deb.	111¼	104½	105½	+1
4% Guar.... ...	109⅞	104	105½	+1
G. NORTHERN (IRELAND)				
Ord.	20	7	15¼	+¼
G. SOUTHERN (IRELAND)				
Ord.	57½	14½	47½	+2
Prefce.	50	25¼	59	+3
Guar.	88¾	51¼	84½	−¼
Deb.	86¼	70	89¼	—
L.P.T.B.				
4½% "A" ...	130	119¾	124½	—
5% "A" ...	139¾	130	134½	—
4½% "T.F.A." ...	113¾	108	110	—
5% "B"	131½	122¾	127	—
"C"	109½	91	105	—
MERSEY				
Ord.	23⅛	9¼	26½	—
4% Perp. Deb. ...	100½	93½	97½	—
3% Perp. Deb. ...	75½	67	76	—
3% Perp. Prefce.	62	47¼	64½	—

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 14th Week			Totals to Date		
	1936	1935	Inc. or Dec.	1936	1935	Inc. or Dec.
L.M.S.R. (6,917 mls.)	£	£	£	£	£	£
Passenger-train traffic...	446,000	412,000	+ 34,000	5,288,000	5,216,000	+ 72,000
Merchandise, &c. ...	522,000	477,000	+ 45,000	6,532,000	6,267,000	+ 265,000
Coal and coke ...	238,000	240,000	— 2,000	3,852,000	3,683,000	+ 169,000
Goods-train traffic ...	760,000	717,000	+ 43,000	10,384,000	9,950,000	+ 434,000
Total receipts	1,206,000	1,129,000	+ 77,000	15,672,000	15,166,000	+ 506,000
L.N.E.R. (6,333 mls.)						
Passenger-train traffic...	298,000	273,000	+ 25,000	3,531,000	3,495,000	+ 36,000
Merchandise, &c. ...	357,000	311,000	+ 46,000	4,543,000	4,369,000	+ 174,000
Coal and coke ...	217,000	208,000	+ 9,000	3,559,000	3,382,000	+ 177,000
Goods-train traffic ...	574,000	519,000	+ 55,000	8,102,000	7,751,000	+ 351,000
Total receipts	872,000	792,000	+ 80,000	11,633,000	11,246,000	+ 387,000
G.W.R. (3,746½ mls.)						
Passenger-train traffic...	191,000	181,000	+ 10,000	2,211,000	2,187,000	+ 24,000
Merchandise, &c. ...	205,000	188,000	+ 17,000	2,600,000	2,512,000	+ 88,000
Coal and coke ...	97,000	96,000	+ 1,000	1,561,000	1,506,000	+ 55,000
Goods-train traffic ...	302,000	284,000	+ 18,000	4,161,000	4,018,000	+ 143,000
Total receipts	493,000	465,000	+ 28,000	6,372,000	6,205,000	+ 167,000
S.R. (2,154 mls.)						
Passenger-train traffic...	269,000	256,000	+ 13,000	3,387,000	3,320,000	+ 67,000
Merchandise, &c. ...	65,000	55,000	+ 10,000	816,000	828,000	— 12,000
Coal and coke ...	31,000	22,000	+ 9,000	517,000	477,000	+ 40,000
Goods-train traffic ...	96,000	77,000	+ 19,000	1,333,000	1,305,000	+ 28,000
Total receipts	365,000	333,000	+ 32,000	4,720,000	4,625,000	+ 95,000
Liverpool Overhead ... (6½ mls.)	1,169	1,088	+ 81	15,653	15,222	+ 431
Mersey (4½ mls.) ...	4,232	4,215	+ 17	58,217	57,164	+ 1,053
*London Passenger Transport Board ...	558,300	535,600	+ 22,700	21,725,100	21,303,200	+ 421,930
IRELAND						
Belfast & C.D. pass. (80 mls.)	1,787	1,703	+ 84	23,731	23,769	— 38
,, ,, goods	640	489	+ 151	7,275	6,562	+ 713
,, ,, total	2,427	2,192	+ 235	31,006	30,331	+ 675
†Great Northern pass. (543 mls.)	8,300	8,000	+ 300	101,500	98,800	+ 2,700
,, ,, goods	11,800	10,150	+ 1,650	128,250	120,900	+ 7,350
,, ,, total	20,100	18,150	+ 1,950	229,750	219,700	+ 10,050
†Great Southern, pass. (2,076 mls.)	30,751	30,035	+ 716	351,717	342,214	+ 9,503
,, ,, goods	44,525	43,992	+ 533	543,909	519,843	+ 24,066
,, ,, total	75,276	74,027	+ 1,249	895,626	862,057	+ 33,569

* 40th week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes
† 13th week.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 15th Week			Totals to Date		
	1936	1935	Inc.or Dec.	1936	1935	Inc. or Dec.
L.M.S.R. (6,917 mls.)	£	£	£	£	£	£
Passenger-train traffic...	671,000	423,000	+ 248,000	5,959,000	5,639,000	+ 320,000
Merchandise, &c. ...	425,000	482,000	— 57,000	6,957,000	6,749,000	+ 208,000
Coal and coke ...	227,000	259,000	— 32,000	4,079,000	3,942,000	+ 137,000
Goods-train traffic ...	652,000	741,000	— 89,000	11,036,000	10,691,000	+ 345,000
Total receipts	1,323,000	1,164,000	+ 159,000	16,995,000	16,330,000	+ 665,000
L.N.E.R. (6,333 mls.)						
Passenger-train traffic...	392,000	284,000	+ 108,000	3,923,000	3,779,000	+ 144,000
Merchandise, &c. ...	288,000	321,000	— 33,000	4,831,000	4,690,000	+ 141,000
Coal and coke ...	202,000	248,000	— 46,000	3,761,000	3,630,000	+ 131,000
Goods-train traffic ...	490,000	569,000	— 79,000	8,592,000	8,320,000	+ 272,000
Total receipts	882,000	853,000	+ 29,000	12,515,000	12,099,000	+ 416,000
G.W.R. (3,746½ mls.)						
Passenger-train traffic...	267,000	180,000	+ 87,000	2,478,000	2,367,000	+ 111,000
Merchandise, &c. ...	169,000	187,000	— 18,000	2,769,000	2,699,000	+ 70,000
Coal and coke ...	95,000	101,000	— 6,000	1,656,000	1,607,000	+ 49,000
Goods-train traffic ...	264,000	288,000	— 24,000	4,425,000	4,306,000	+ 119,000
Total receipts	531,000	468,000	+ 63,000	6,903,000	6,673,000	+ 230,000
S.R. (2,154 mls.)						
Passenger-train traffic...	389,000	270,000	+ 119,000	3,776,000	5,590,000	+ 186,000
Merchandise, &c. ...	55,000	67,000	— 12,000	871,000	895,000	— 24,000
Coal and coke ...	26,000	30,000	— 4,000	543,000	507,000	+ 36,000
Goods-train traffic ...	81,000	97,000	— 16,000	1,414,000	1,462,000	+ 12,000
Total receipts	470,000	367,000	+ 103,000	5,190,000	4,992,000	+ 198,000
Liverpool Overhead ... (6½ mls.)	1,072	1,109	— 37	16,725	16,331	+ 394
Mersey (4½ mls.) ...	4,018	3,916	+ 102	62,235	61,080	+ 1,155
*London Passenger Transport Board ...	525,900	543,500	— 17,600	22,251,000	21,846,700	+ 404,300
IRELAND.						
Belfast & C.D. pass. (80 mls.)	2,070	1,852	+ 218	25,801	25,621	+ 180
,, ,, goods	551	580	— 29	7,826	7,142	+ 684
,, ,, total	2,621	2,432	+ 189	33,627	32,763	+ 864
†Great Northern pass. (543 mls.)	10,300	7,400	+ 2,900	111,800	106,200	+ 5,600
,, ,, goods	10,500	9,700	+ 800	138,750	130,600	+ 8,150
,, ,, total	20,800	17,100	+ 3,700	250,550	236,800	+ 13,750
†Great Southern pass. (2,076 mls.)	32,944	29,990	+ 2,954	384,661	372,204	+ 12,457
,, ,, goods	40,948	39,582	+ 1,366	584,857	559,425	+ 25,432
,, ,, total	73,892	69,572	+ 4,320	969,518	931,629	+ 37,889

* 41st week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes
† 14th week.

NOTES AND NEWS

Bakerloo Tube Extension.—The London Passenger Transport Board has just begun work on the Finchley Road to Baker Street tube extension, which is estimated to cost about £2,000,000.

Loud-speakers at Paddington.—The Great Western Railway has installed loud-speakers for directing passengers at Paddington station, and these were brought into use for dealing with the Easter holiday traffic.

Record Southern Railway Continental Traffic.—The Southern Railway records that the number of passengers from Victoria to the Continent on the Thursday before Easter broke the previous record for the station. The total was 12,912, spread over 39 trains, compared with the previous record of 12,824 in 1928.

Tilling & British Automobile Traction Limited.—On and after April 20 the registered office of this company will be at Brettenham House, Lancaster Place, Strand (instead of 88, Kingsway, W.C.2, as heretofore). The telephone number will be Temple Bar 4124, and the telegraphic address Busways Rand London.

Railway Companies and Accident Liability.—The United Commercial Travellers' Association has been informed by the Railway Clearing House that the main line railway companies have decided to limit non-liability in respect of accidents to passengers holding cheap day, half-day, or evening tickets. In respect of all other tickets, including tickets issued to commercial travellers, where the availability exceeds one day, the companies will issue tickets under the same conditions as those under which ordinary tickets are issued.

Agreed Charges.—Fifty-one more applications for the approval of agreed charges have been lodged with the Railway Rates Tribunal, as will be seen from the legal notice published on page 762. A copy of each application (1s. post free) may be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, S.W.1. Notices of objection must be filed with the Registrar of the Tribunal, Bush House, Aldwych, W.C.2, and a copy of each objection sent to Mr. Cole Deacon on or before April 28.

New 111-mile American Project.—The longest new railway projected for several years is to be constructed by the Atchison, Topeka & Santa Fé Railway from Boise City, Okla., to Las Animas, Col., a distance of 111 miles. The estimated cost is $3,750,000, states a Reuters message. The line is important in that it will form part of the Las Animas–Amarillo, Texas, route and will constitute the last link in the through chain between various centres in Colorado and in Texas. It is claimed that a saving of from 142 to 226 miles in freight movements will be effected by the completion of the new line. Not since 1932 has new construction in the U.S.A. exceeded 76 miles in any year.

Thames Valley Bus Acquisition.—The Thames Valley Traction Co. Ltd. (a G.W.R. and S.R. associate) has arranged to take over the business of the Chiltern Bus Co. Ltd.

Another G.W.R. Halt.—The G.W.R. opened a new halt at Easthope, between Presthope and Longville, Shropshire, on Saturday, April 4. All trains call at the new halt, and the usual cheap fares to places in the surrounding district are given.

Mansion House Association on Transport.—The annual business lunch of the Mansion House Association on Transport will be held at the Trocadero Restaurant, Piccadilly, on May 8, at 1.15 for 1.30 p.m., and will be followed by the annual general meeting. Mr. Leslie Hore-Belisha, the Minister of Transport, will speak at the luncheon.

Accident to Mexican Express.—The explosion of a bomb on a bridge near Paso del Macho derailed the engine and the first four coaches of the night express from Vera Cruz to Mexico City on April 6. It is reported that 13 persons were killed and 22 injured, as a result of the locomotive and leading coaches falling into a ravine and some of the other vehicles catching fire.

Weekly Holiday Season Tickets.—The British main-line railways have reintroduced first and third class weekly holiday season tickets, which are to be issued until October 31. These run-about tickets allow unlimited travel within a hundred different holiday zones, and are obtainable at railway stations on request; the cost is approximately 15s. first class and 10s. third class. Weekly holiday season tickets are also issued for dogs and bicycles.

Standard and Exceptional Charges.—As will be seen from the legal notice published on page 763, the Railway Rates Tribunal will sit at 10.30 a.m. on Wednesday, May 20, to review the standard and exceptional charges of each of the amalgamated companies. The accounts and statements relative to such review, lodged with the tribunal by the companies, may be inspected at the office of the Registrar, Bush House, Aldwych, W.C.2. Notices of objection or submission must be filed with the Registrar on or before Thursday, May 7.

Important Railway Opened in Asiatic Turkey.—A Reuters message from Ankara, dated April 8, states that the new railway between Afion Kara Hissar (which means The Black Fortress of Opium) and Adalia (Antalya), on the Mediterranean coast, has been formally inaugurated by the Prime Minister, General Ismet Ineunu. It would appear that it is the final section which has now been opened. The message adds that the new section is about 78 miles long, cost about £568,750, and took 14 months to complete. The whole railway from Afion Kara Hissar to Adalia (to which we referred on page 283 of our issue of August 17, 1934) is about 256 km. (160 miles) long.

Cammell Laird & Co. Ltd.—At an extraordinary general meeting of this company called for May 1 next, resolutions will be submitted for the conversion of the 6,300,000 ordinary shares of 5s. each into £1,575,000 ordinary stock, which is to be transferable in sums of 5s. or multiples of 5s.

Road Accidents.—The Ministry of Transport return for the weeks ended April 4 and 11 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding periods of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England ...	92	(75)	3,089	(2,799)
Wales	2	(3)	128	(122)
Scotland ...	7	(7)	315	(264)
Totals, April 4	101	(85)	3,532	(3,185)
England ...	90	(77)	3,545	(3,171)
Wales	4	(7)	175	(118)
Scotland ...	9	(7)	328	(302)
Totals, April 11	103	(91)	4,048	(3,591)

The week ended April 11 this year included the Easter exodus; last year Good Friday fell on April 19.

Institution of Railway Signal Engineers.—At the general meeting, held in the offices of the L.M.S.R. at Hunt's Bank, Manchester, the President, Mr. W. S. Roberts, announced the details of the summer meeting, to be held in Liverpool on June 19 and 20. He also thanked the Cheshire Lines Committee for the facilities granted that day for members to visit the power signalling at Manchester Central station and the L.M.S.R. for the accommodation provided them at Hunt's Bank. Mr. W. H. R. Webb then read a paper entitled "Some Notes on Electric Interlocking," which aroused much interest. In the discussion the following spoke: Messrs. W. S. Every, E. G. Brentnall, P. A. Langley, S. W. Spendlove, T. Palmer, J. H. Currey, C. Carslake, E. W. Challis, and the President.

London Transport Arbitration.—At the sitting of the London Transport Arbitration Tribunal on April 6, Mr. Joshua Scholefield, K.C., the President, remarked that it was probably the last sitting, and took the opportunity to outline the work of the tribunal since its formation. He said that the tribunal was appointed at the end of September, 1933, and as a result of a great many hearings had issued 80 awards, orders, and approvals of agreements. In these it had sanctioned the payment by the London Passenger Transport Board of £2,295,395 17s. 5d. in cash and the issue by the board of stock of the face value of £2,566,056. These represented the consideration for the transfer of 65 undertakings to the board. In addition to this the tribunal had sanctioned a

pooling scheme affecting the board and the four main-line railway companies. In that pooling scheme the disposal of receipts which had amounted in the preceding year to between £38,000,000 and £39,000,000, was arranged. The claims of the independent undertakings totalled more than £9,000,000. In addition, the sum involved in the transfer of tramway undertakings of local authorities amounted to over £1,000,000.

Further L.M.S.R. May Timetable Alterations.—Additional to the L.M.S.R. train service alterations announced in our issue of April 3, to come into operation on May 4 next, various minor accelerations are being made to the services of that company in Scotland. Of the daily trains between Glasgow and Aberdeen, six are speeded up by an average of 3 min. apiece, and there are accelerations averaging 10 min. per train on all the services between Inverness, Wick, and Thurso. The fastest train between Inverness and Wick will average 28·7 m.p.h., or from June 26, 32·1 m.p.h. Between Glasgow and Ayr, twelve trains in all of the morning and evening business services are expedited by an average of just over 3 min. each.

Summer Trains on the G.W.R.—Announcement is made of the alteration of services which will take place on the G.W.R. during the summer season, from July 6 to September 27. These will follow the customary lines, with but few innovations, except for some improvements on Sundays, when the 9.10 a.m. express from Paddington to Plymouth will start 30 min. later and be accelerated; a non-stop express from Paddington will run at 12 noon in 3 hr. 35 min. to Torquay; a new train will leave Paddington at 11.10 a.m. for Weymouth, Ilfracombe, Exeter, and South Devon; and new trains will leave Swansea and Cheltenham for London at 5.30 and 6.55 p.m., respectively. A new service will also run on Saturdays from Paddington at 2.15 p.m. for Weymouth, Minehead, and Ilfracombe.

Extent of Future British Control of Iraq Railways.—The text of the final agreement for the transference of ownership of the Iraq Railways from Britain to Iraq has now been published, states a Reuters message from Baghdad. The transfer will take effect as soon as the British Government receives from Iraq the sum of £400,000—payable within 20 days—and the Board of Management has been constituted. Iraq undertakes that the management shall be entrusted for 20 years to a board consisting of five persons, namely, a Minister of State (who shall be president), a general manager, and three others, one of whom shall be a British subject, appointed by the Government of Iraq. The agreement stipulates also that during this 20-year period certain key posts in the administration of the railway, including those of general manager, chief engineer, chief mechanical engineer, and traffic manager, shall be filled by British subjects.

CONTRACTS AND TENDERS

S.R. Electrification Orders

Rapid progress is being made with the electrification of the Southern Railway Portsmouth main line and the following contracts for apparatus required in connection with this extension have been placed:—

Bruce Peebles & Co. Ltd., thirty 2,500 kW. steel tank rectifier equipments, complete with transformers.

British Thomson-Houston Co. Ltd., thirty 4,000-ampere high speed circuit breakers and 262 2,500 ampere high speed circuit breakers.

Asea Electric Limited, 30 sets of 33,000 volt switchgear equipments, 30 sets of low tension gear and 30 sets of supervisory control apparatus.

Bogie Wagons for L.N.E.R.

The L.N.E.R. has placed orders for 100 40-ton twintuple bogie bolster wagons, divided equally between the Metropolitan-Cammell Carriage & Wagon Co. Ltd. and the Birmingham Railway Carriage & Wagon Co. Ltd.

Boiler Washing Plant for L.N.E.R.

The Economical Boiler Washing Co. Ltd. has received an order from the L.N.E.R. for one Economical hot-water boiler washing plant of the standard double tank type for the locomotive depot at Ardsley, near Leeds.

The British Thomson-Houston Co. Ltd. has secured a contract for Mazda lamps from the L.N.E.R. for the twelve months ending April 30, 1937.

The Metropolitan-Vickers Electrical Co. Ltd. has received from the L.N.E.R. a part contract for the supply of Cosmos electric lamps for the twelve months ending April 30, 1937.

Ballast Wagons for the S.R.

The Metropolitan-Cammell Carriage & Wagon Co., Ltd., has received an order from the Southern Railway for 22 40-ton bogie hopper ballast wagons.

Diesel Locomotives Wanted.

The South African Railways & Harbours Board is calling for tenders, for the supply and delivery of one diesel-electric shunting locomotive of the two bogie type and 60 tons total weight for 3 ft. 6 in. gauge and one diesel-electric or diesel-mechanical shunting locomotive of the three axle type and 36 tons total weight for 3 ft. 6 in. gauge.

Miller & Co. Ltd. has received an order from the Entre Rios Railways for 300 chilled cast-iron wheels for wagons.

Howell & Co. Ltd. has received an order from the Central Argentine Railway for 1,000 Aquacidox quality steel boiler tubes.

The South African Railways and Harbours Board has placed the following orders:—

United Steel Co. Ltd.: Ferro-manganese.
Usines Acieries: Cast steel buttresses.
North West Rivet, Bolt & Nut Factory Limited: Tee-headed bolts and washers.
Rubery, Owen & Co. Ltd.: Bolts, nuts, and rivets.

The British Oxygen Co. Ltd. has moved its head office to Thames House, Millbank, S.W.1. The telephone number is Victoria 9225 and telegraphic address "Aceterator," Sowest, London.

BRITISH SEPARATORS. — Vickers Limited advise us that the Alfa-Laval Co. Ltd., of Brentford, which is the sole agent of Aktiebolaget Separator of Stockholm for Great Britain and Ireland for the manufacture and sale of the well-known De Laval separators, has now acquired from Cooke, Troughton & Simms Limited (a Vickers subsidiary) control of the business of British Separators Limited. The separators sold by British Separators Limited, which are known throughout the trade as Vickcen, have been installed in the *Queen Mary*. The purchasing company is making adequate arrangements for the servicing of Vickcen separators and the supply of spare parts. As from April 1, all inquiries for Vickcen separators, filters, and parts should be addressed to British Separators Limited, Great West Road, Brentford, Middlesex.

Forthcoming Events

Apr. 14-18.—Model Railway Club Exhibition, at Central Hall, Tothill Street, London, S.W.1. *The Railway Magazine* Lantern Lectures:—Apr. 17 (*Fri.*), 6 p.m. "Train Speeds," by Mr. Cecil J. Allen. Apr. 18 (*Sat.*), 3.15 p.m. "The Locomotive as a Prototype for Models," by Mr. J. N. Maskelyne.

Apr. 21 (*Tues.*).—Institute of Transport (Birmingham), at Queen's Hotel, 6 p.m. Annual General Meeting.

Institute of Transport (London), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. "Transport Developments in 1935," by Mr. R. Bell.

Institution of Civil Engineers, Great George Street, London, S.W.1, 6 p.m. "The Rational Design of Steel Building Frames," by Prof. J. Baker.

Apr. 22 (*Wed.*).—Institute of Transport (Manchester-Liverpool Graduate), at Grosvenor Hotel, Deansgate, Manchester, 6.45 p.m. Annual General Meeting. "British Railway Signalling—Past, Present and Future," by Mr. J. Boustead.

Apr. 23 (*Thurs.*).—Institute of Fuel at Chemical Society, Burlington House, Piccadilly, London, W.1, 6 p.m. "The Technique of Hydrogenation of Coal and its Products," by Dr. J. King. Informal Dinner at Café Royal, Regent Street, W.1.

Institution of Electrical Engineers, Savoy Place, London, W.C.2, 6 p.m. Kelvin Lecture, by Mr. J. Cockcroft.

Institution of Locomotive Engineers (London), at Inst. of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. "Some Suggestions on Steam Locomotive Design," by Mr. J. Beaumont.

Permanent Way Institution (Sectional), at Lecture Room, New England Street, Brighton, 7 p.m. "The Geology of S.E. England and its Relation to the Railways," by Mr. D. Bennett.

Apr. 24 (*Fri.*).—Institute of Transport (Leeds Graduate), at Leeds Transport Department, 7 p.m. Annual General Meeting.

Institute of Transport (Manchester-Liverpool), at Manchester, 6.30 p.m. Annual General Meeting. "The Outlook for Transport," by Mr. D. R. Lamb.

Institute of Transport (Newcastle), at Royal Station Hotel, 7.30 p.m. Annual General Meeting.

Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 6 p.m. Second Report of the Welding Research Committee.

LEGAL AND OFFICIAL NOTICES

In the Court of the Railway Rates Tribunal.

Road and Rail Traffic Act, 1933. Agreed Charges.

NOTICE IS HEREBY GIVEN that Applications for the approval of Agreed Charges under the provisions of Section 37 of the Road and Rail Traffic Act, 1933, short particulars of which are set out in the Schedule hereto, have been lodged with the Railway Rates Tribunal.

The said Applications may be inspected at the Office of the Tribunal, Bush House, Aldwych, London, W.C.2, at any time during office hours and at the following places :—

LONDON : Railway Clearing House, 123, Seymour Street, N.W.1.
BIRMINGHAM : District Goods Manager's Office, Snow Hill, Great Western Railway.
CARDIFF : Divisional Superintendent's Office, Great Western Railway.
EXETER : Western Divisional Superintendent's Office, Southern Railway.
LEEDS : District Goods Manager's Office, Wellington Street, London & North Eastern Railway.
LEICESTER : District Goods and Passenger Manager's Office, London Midland & Scottish Railway.
MANCHESTER : District Goods Manager's Office, Hunt's Bank, London Midland & Scottish Railway.
SOUTHAMPTON : Southern Divisional Superintendent's Office, Southampton Central, Southern Railway.
YORK : Goods Manager's Office, London & North Eastern Railway.
ABERDEEN : District Goods and Passenger Manager's Office, London Midland & Scottish Railway.
EDINBURGH : District Goods and Passenger Manager's Office, Waverley Station, London & North Eastern Railway.
GLASGOW : Commercial Manager's Office, Central Station, London Midland & Scottish Railway.

A copy of each Application lodged with the Tribunal can be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, Westminster, London, S.W.1, price 1s., post free.

Notices of objection by any parties entitled to object to the approval of any of the said Agreed Charges must state concisely the grounds of objection and must be filed at the office of the Registrar, Bush House, Aldwych, London, W.C.2, on or before the 28th day of April, 1936, and a copy thereof on or before the same day served on or sent by registered post to Mr. G. Cole Deacon, at the above Address. A separate Notice must be filed and served in respect of each Application.

Each Notice filed must be on foolscap size paper and must be stamped with an adhesive fee stamp for 2s. 6d. (which can be purchased at the office of the Tribunal only). If sent by post for filing each Notice must be accompanied by a Postal Order for 2s. 6d. payable to the Registrar when a stamp will be affixed at the office. A Notice by a Representative Body of Traders must contain a statement of the facts upon which such Body claims to represent a substantial number of traders interested in, or likely to be affected by the decision on, the application.

Five additional copies of each Notice must be lodged with the original at the office of the Registrar.

T. J. D. ATKINSON,
Registrar.

3rd April, 1936.

Number of Application and Date of Lodgment	Parties to Agreement	Nature of Agreed Charge
1936. No. 158—March 16, 1936	THE BRITISH GAS & TORCH CO. LTD., 10, Victoria Street, London, S.W.1, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per cylinder of Gas.
1936. No. 163—March 31, 1936	WILLIAM THOMAS BAKER, 48 Cape Hill, Smethwick, Staffs, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos. and L.P.T.B.	Pyrogas in cylinders. Per Live Pig. Live Pigs consigned to Registered Bacon Curers or their Agents.
	This application, by leave granted under Rule 4, relates also to an Agreed Charge with another Registered Bacon Curer in Great Britain as specified therein.	
1936. No. 164—March 31, 1936	J. & I. BATTEN & CO. LTD., 24 and 25, Rood Lane, London, E.C.3, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Tea and Coffee from the Trader's Park Street premises, Southwark.
1936. No. 165—March 31, 1936	WM. GAYMER & SON LTD., Attleborough, Norfolk, and the L. & N.E. Railway Co.	Per ton. Cider in casks or cases ; Advertising Matter ; Articles for use in connection with the Trader's business.
1936. No. 166—March 31, 1936	C. & J. HAMPTON LIMITED, Record Works, Sheffield, 9, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Vices and Cramps, Wrenches, Lifting Jacks, Steel in bars and bundles, Metal Planes, Machine Tool Stands, Empties returned to Suppliers.
1936. No. 167—March 31, 1936	F. W. HARMER & CO. LTD., St. Andrew's Works, Norwich, and the L. & N.E. Railway Co. and the M. & G.N. Joint Committee	Per ton. Clothing, Floor Coverings ; Drapery articles ; Boots and Shoes ; Empties returned to Suppliers.
1936. No. 168—March 31, 1936	IMPERIAL SERVICE WINE ASSOCIATION LIMITED, 30, Mark Lane, London, E.C.3, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Wines and Spirits in casks or cases.
1936. No. 169—March 31, 1936	THE KLINGER MANUFACTURING CO. LTD., Silver Street, Edmonton, London, N.18, and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per ton. Hosiery ; Empties returned to Suppliers.
1936. No. 170—March 31, 1936	PETER LUNT & CO. LTD., Aintree, Liverpool, 10, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per ton. Candles ; Soap ; Metal and Floor Polishes ; Insecticides Advertising Matter.
1936. No. 171—March 31, 1936	JOHN F. RENSHAW & CO. LTD., Mitcham, Surrey, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Confectionery, Shelled Almonds.
1936. No. 172—March 31, 1936	BENJAMIN RUSSELL & SONS LTD., Eastern Boulevard, Leicester, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Hosiery, Woollen and Worsted Yarn.
1936. No. 173—March 31, 1936	STANDARD SOAP CO. LTD., Ashby-de-la-Zouch, and the L.M. & S. Railway Co. ..	Per ton. Soap and Soap with articles for advertisement.
	Applicable also to traffic consigned by one Associated or Subsidiary Company.	
1936. No. 174—March 31, 1936	ULTRA ELECTRIC LIMITED, Western Avenue, Acton, London, W.3, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Wireless Receivers and Apparatus ; Empties returned to Suppliers.
1936. No. 175—March 31, 1936	WINDSOR WORKS LIMITED, Venn Street, Clapham Common, London, S.W.4, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Drapery articles ; Haberdashery ; Druggists' Sundries ; Miscellaneous Articles such as Boot Studs, Button Hooks, Brushes, Electric Lamps and Bulbs, Gas Mantles, String and Stationers' Sundries ; Advertising Material ; Empties returned to Suppliers.
1936. No. 176—March 31, 1936	BRADFIELD, IBBERSON & CO. LTD., King's Lynn, Norfolk, and the L. & N.E. Co., and the M. & G.N. Joint Committee	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 177—March 31, 1936	C. & J. CLARK LIMITED, Street, Somerset, and the Somerset & Dorset Joint Committee	Per package. Boots, Shoes and Leather.
1936. No. 178—March 31, 1936	J. DARNELL & SON LTD., 76 to 94, Kingsland Road, London, E.2, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per package. Boots and Shoes.
1936. No. 179—March 31, 1936	F. W. HARMER & CO. LTD., St. Andrew's Works, Norwich, and the L. & N.E. Railway Co. and the M. & G.N. Joint Committee	Per package. Boots, Clothing, Hosiery, Mantles, Piece Goods and Shirts.
1936. No. 180—March 31, 1936	RICHMOND SAUSAGE CO. LTD., 7–11, Linacre Road, Litherland, Liverpool, 21, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per ton. Sausages.
1936. No. 181—March 31, 1936	BENJAMIN RUSSELL & SONS LTD., Eastern Boulevard, Leicester, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Hosiery.
1936. No. 182—March 31, 1936	ALLIED SUPPLIERS LIMITED, 179/189, City Road, London, E.C.1, and the G.W. Railway Co.	Per ton. Multiple Shop Traffic (Provisions, &c.).
1936. No. 183—March 31, 1936	ALLIED SUPPLIERS LIMITED, 179/189, City Road, London, E.C.1, and the G.W. and L.M. & S. Railway Cos.	Per ton. Eggs, Lard, Preserves, Provisions and Sugar.
1936. No. 184—March 31, 1936	ALLIED SUPPLIERS LIMITED, 179/189, City Road, London, E.C.1, and the L.M. & S. Railway Co.	Per ton. Multiple Shop Traffic (Provisions, &c.).
1936. No. 185—March 31, 1936	THE CITY AND PROVINCIAL STORES LIMITED, Atlantic Mills, Manchester, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per package. Furniture and Household Requisites.
1936. No. 186—March 31, 1936	ENSIGN LIMITED, Ensign House, 88/89, High Holborn, London, W.C.1, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Photographic Apparatus, Chemicals and Accessories ; Cinematograph Machines (Amateur) ; Wireless Apparatus ; Battery Cells ; Dry Accumulators ; Automatic Delivery (slot) Machines ; Corrugated Paper ; Toys ; Fancy Goods ; Hardware ; Advertising Material ; Empties returned to Suppliers.
1936. No 187—March 31, 1936	GARDNER, TITLEY & WIDGERY LIMITED, 14/16, Queen Square, Bristol, 1, and the G.W. and L.M. & S. Railway Cos.	Per ton. Groceries, Preserves and Provisions ; Confectionery ; Eggs ; Fruit ; Onions ; Matches ; Salines ; Water Glass ; Printed and Advertising Matter.
1936. No. 188—March 31, 1936	THE GREAT UNIVERSAL STORES LIMITED, Devonshire Street, Ardwick, Manchester, and the Cheshire Lines Committee and the G.W., L. & N.E., and L.M. & S. Railway Cos.	Per consignment. Furniture, General Stores Wares and Advertising Matter (except when returned to Suppliers) in consignments which, under ordinary charging arrangements, would be charged under the " Small Parcels Scale."

Legal and Official Notices—*continued*

Number of Application and Date of Lodgment	Parties to Agreement	Nature of Agreed Charge
	Applicable also to traffic consigned by five Associated or Subsidiary Companies.	
1936. No. 189—March 31, 1936	THE GREAT UNIVERSAL STORES LIMITED, Devonshire Street, Ardwick, Manchester, and the L.M. & S. Railway Co.	Per consignment. Furniture, General Stores Wares and Advertising Matter in consignments which, under ordinary charging arrangements, would be charged under the " Small Parcels Scale."
	Applicable also to traffic consigned by three Associated or Subsidiary Companies.	
1936. No. 190—March 31, 1936	THE IOCO RUBBER & WATERPROOFING CO. LTD., Netherton Works, Anniesland, Glasgow, W.3, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Cotton Goods, India Rubber Goods, Waterproof Clothing and Paper; Empties returned to Suppliers.
1936. No. 191—March 31, 1936	JOHN KAY LIMITED, Doreth House, Cowper Street, London, E.C.2, and the G.W., L.M. & S., L. & N.E. and Southern Railway Cos.	Per ton. Groceries, Preserves and Provisions; Mixed Groceries; Eggs; Fruit; Cleansing Powders; Manufactured Tobacco and Cigarettes; Matches; Paper; Razor Blades; Salines; String.
1936. No. 192—March 31, 1936	FREDERICK LAWRENCE LIMITED, Westbourne Grove, London, W.2, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Furniture and Furnishings; Empties returned to Suppliers.
1936. No. 193—March 31, 1936	HENRY LISTER & SONS LTD., Troydale Mill, Pudsey, Yorks, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Cloth (Textiles).
1936. No. 194—March 31, 1936	LOUIS MARX & CO. LTD., Waddam's Pool Works, Dudley, and the G.W. and L.M. & S. Railway Cos.	Per ton. Toys.
1936. No. 195—March 31, 1936	NEWTON MILL LIMITED, 7, Paternoster Square, London, E.C.4, and the L. & N.E. and L.M. & S. Railway Cos.	Per ton. Stationery and Paper.
1936. No. 196—March 31, 1936	SCOTT & TURNER LIMITED, Gallowgate, Newcastle-on-Tyne, and the L. & N.E. Railway Co.	Per ton. Salines; Baking Powder; Cake Flour prepared; Gravy Salt; Jellies; Medicines and Advertising Material.
1936. No. 197—March 31, 1936	WITCHAMPTON BY-PRODUCTS LIMITED, Riverside Works, Weybridge, and the Southern Railway Co.	Per ton. Firelighters.
1936. No. 198—March 31, 1936	BALLINGTON HOSIERY LIMITED, Ballito Hosiery Mills, Hatfield Road, St. Albans, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Hosiery and Advertising Matter.
1936. No. 199—March 31, 1936	CARRICK'S (CATERERS) LIMITED, Low Row, near Carlisle, and the L. & N.E. Railway Co.	Per package. Black Puddings, Cake, Cooked Meats, Cream in bottles, Fruit Puddings, Pies, Polonies, Sausages and Sweetmeats, Packet Cheese.
1936. No. 200—March 31, 1936	COHEN & WILKS LIMITED, Aquatite Mills, Derby Street, Cheetham, Manchester, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing and Advertising Matter.
1936. No. 201—March 31, 1936	FLEMING, REID & CO. LTD., Greenock, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Artificial Silk Goods, Hosiery, Woollen Goods and Yarn, Knitting Pins, Mushroom Darners, Rug Gauges and Advertising Matter.
1936. No. 202—March 31, 1936	McGROUTHER LIMITED, Cornton Road, Stirling, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Bacon, Margarine, Meat and Sausages.
1936. No. 203—March 31, 1936	J. PICK & SONS LTD., Leicester, and the L. & N.E. and L.M. & S. Railway Cos. ..	Per package. Knitted Outwear.
1936. No. 204—March 31, 1936	SOMERVELL BROS. LTD., Kendall, and the L.M. & S. Railway Co.	Per package. Boots, Shoes and Advertising Matter.
1936. No. 205—March 31, 1936	S. & J. WATTS & CO., Manchester, and the Cheshire Lines Committee and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 206—March 31, 1936	DAIRY SUPPLY CO. LTD., Cumberland Avenue, Park Royal, N.W.10, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Dairy Machinery Appliances and Utensils and Materials used in connection therewith, such as Calcium Chloride, Cotton Wadding and Soda Ash; Advertising Material; Empties returned to Suppliers.
	Applicable also to traffic consigned by one Associated or Subsidiary Company.	
1936. No. 207—March 31, 1936	SPILLERS LIMITED, 40, St. Mary Axe, London, E.C.3, and the L. & N.E. Railway Co.	Per ton. Biscuits, Dog, and Hardbread; Bird Seed; Condiments, Biscuit Meal for Dog or Poultry feeding; Poultry and Game Foods; Advertising Matter.
1936. No. 208—March 31, 1936	THE CITY AND PROVINCIAL STORES, Atlantic Mills, Manchester, and the Cheshire Lines Committee, and the G.W., L. & N.E. and L.M. & S. Railway Cos.	Per package. Clothing, Drapery and General Stores Wares.
1936. No. 209—March 31, 1936	J. LYONS & CO. LTD., Cadby Hall, Kensington, London, W.14, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per ton. Chocolates, Mixed Pastries, Slab Cake and Advertising Matter, packed with the commodity.
1936. No. 210—March 31, 1936	MORGAN CRUCIBLE CO. LTD., Battersea Works, Church Road, London, S.W.11, and the G.W., L. & N.E., L.M. & S. and Southern Railway Cos.	Per package. Carbon and Copper Powder, Carbon Brushes (Metal-ware), Carborundum Cloth, Castings (Iron and Steel), Chamotte, Dextrine, Electrical Accessories, such as Carbon Blocks, Plates, Rings and Rods, Firebricks, Fireclay and Fireclay Ware, Founders' Dust, Graphite, Grease, Jointing Cement, Machinery, Paint, Plumbago and Clay Crucibles and Parts, Silicon Carbide, Silicon Carbide Bricks and Tubes and Wireless Parts.
1936. No. 211—March 31, 1936	STEAD & SIMPSON LIMITED, Belgrave Gate, Leicester, and the L. & N.E. and L.M. & S. Railway Cos.	Per package. Boots and Shoes.
1936. No. 212—March 31, 1936	SAML. HANSON & SON LTD., 14, Eastcheap, London, E.C.3, and the G.W. Railway Co.	Per ton. Confectionery and Preserves.

In the Court of the Railway Rates Tribunal.
Railways Act 1921

1936 Review of Standard Charges and Exceptional Charges

NOTICE IS HEREBY GIVEN that the Railway Rates Tribunal will sit at 10.30 a.m. on Wednesday, the 20th May, 1936, in Court "A," Judges' Quadrangle, Royal Courts of Justice, London, W.C.2, to review the Standard Charges and Exceptional Charges of each of the Amalgamated Companies pursuant to the provisions of Section 59 of the Railways Act, 1921.

NOTICE IS FURTHER GIVEN that the Accounts and Statements relative to such Review lodged with the Tribunal by the said Amalgamated Companies may be inspected at the Office of the Registrar, Bush House, Aldwych, London, W.C.2, at any time during office hours. Copies of the Statements lodged by each of the four Amalgamated Companies (price 7s. 6d. each, or £1 10s. per set, post free) may be obtained, on prepayment, from Mr. G. Cole Deacon, 35, Parliament Street, Westminster, S.W.1.

Any body or person desiring to make any Objection or Submission relative to the Review must file a Notice of their or his Objection or Submission with the Registrar of the Court on or before Thursday, 7th May, 1936. A separate Notice must be filed in relation to each Amalgamated Company.

Each Notice must be on foolscap size paper and must state concisely the ground or grounds of such Objection or Submission, and must be stamped with an adhesive fee stamp for 2s. 6d. (which can be purchased at the office of the Tribunal only). If sent by post each Notice must be accompanied by a Postal Order for 2s. 6d. payable to the Railway Rates Tribunal, when a stamp will be affixed at the office. Five additional copies of each Notice must be lodged with the original at the office of the Registrar.

Only the Amalgamated Companies and any body or person filing such Notice of Objection or Submission as aforesaid will be entitled to apply to be heard on the Review.

Dated this 6th day of April, 1936.

T. J. D. ATKINSON,
Registrar.

THE MADRAS & SOUTHERN MAHRATTA RAILWAY COMPANY LIMITED invite Tenders for :—

37,000 STEEL TIE BARS FOR CAST-IRON POT SLEEPERS.

Specification and Form of Tender can be obtained at the Company's Offices, 25, Buckingham Palace Road, Westminster, S.W.1.

Fee ONE GUINEA, *which will not be returned.*

Tenders must be submitted not later than 2 o'clock p.m. on TUESDAY, 28TH APRIL, 1936.

The Directors do not bind themselves to accept the lowest or any Tender and reserve to themselves the right of reducing or dividing the order.

By Order of the Board,
G. W. V. DE RHE PHILIPE,
Secretary.

Railway Share Market

Conditions in the stock and share markets have been firmer in most sections, although the volume of business is reported to have remained on the small side. Best prices were not maintained by Home Railway stocks, but they continued active, aided by the very favourable views current with regard to the outlook for traffic receipts during the next few months. Last week's traffics created an excellent impression even allowing for the fact that the Easter holiday fell a week later last year, so that comparison is with a normal week in 1935.

L.M.S. stocks have been favoured on the continued excellent increase in traffics, that for the past week being £159,000, which raises the aggregate increase for the year to-date to £665,000. The ordinary continued to attract attention on growing hopes that resumption of dividends with a small payment seems likely on present indications. The 4 per cent. preference and 1923 preference were in request, particularly the latter, which benefited from the view that the price may go to 80 or over later in the year if traffics remain favourable. L.N.E. second preference was active and the first preference was bought on any reaction. The market is taking the view that there seem good grounds for expecting the latter will receive its full 4 per cent. dividend for the current year, in which case there might be a very good advance in price as time proceeds. Southern deferred and preferred were relatively dull on some disappointment that the increase in the past week's traffics was not larger. London Transport "C" was fractionally lower on the £17,600 decrease in traffics for last week, but the aggregate increase to-date is still over £400,000.

Foreign railway stocks have been featureless and on balance there are no changes of importance in those of the Argentine railway companies, but Cordoba Central debentures were again active, due partly, it was reported, to buying from South America. San Paulo have gone back to 54, awaiting the dividend announcement. Antofagasta showed some response to the view that the railway is likely to benefit from the fresh arrangements concerning the Bolivian exchange. International of Central America remained under the influence of the past year's results and the preference moved in favour of holders. American railroad stocks gained a point or more in many cases and Union Pacific was particularly good. Canadian Pacific was little changed.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1935-36	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1935	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1935	Prices: Lowest 1935	Prices: Apr. 15, 1936	Prices: Yield (See Note)
South & Central America.	Antofagasta (Chili)&Bolivia	834	12.4.36	£ 13,560	– £ 1,370	15	£ 203,300	£ 184,550	+ £ 18,750	Ord. Stk.	23	14 15/16	23	Nil
	Argentine North Eastern ..	753	11.4.36	7,203	– 449	41	318,890	297,846	+ 21,044	,,	7	4	5	Nil
	Argentine Transandine ..	—	—	—	—	—	—	—	—	A. Deb.	49 1/2	30	47 1/2	8 7/16
	Bolivar	174	Mar., 1936	7,600	+ 500	13	19,750	19,550	+ 200	6 p.c. Deb.	13	5	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	14	11	14	39/16
	Buenos Ayres & Pacific ..	2,806	11.4.36	102,526	+ 1,698	41	3,411,497	3,141,120	+ 270,377	Ord. Stk.	10 1/2	4 7/8	8 1/2	Nil
	Buenos Ayres Central ..	190	21.3.36	$74,200	– $19,600	38	$4,266,800	$4,211,700	+ $55,100	Mt. Deb.	21	10	17 1/2	Nil
	Buenos Ayres Gt. Southern	5,084	11.4.36	121,210	– 28,760	41	5,385,526	5,940,224	– 554,698	Ord. Stk.	27	13 1/2	18	Nil
	Buenos Ayres Western ..	1,930	11.4.36	48,237	– 1,438	41	1,835,044	1,829,799	+ 5,245	,,	24	10	14	Nil
	Central Argentine	3,700	11.4.36	108,984	– 31,179	41	4,919,015	4,878,172	+ 40,843	,,	17 7/8	7	11	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	9	3 1/4	6 1/2	Nil
	Cent. Uruguay of M. Video	273	4.4.36	14,263	+ 3,072	40	438,496	562,451	– 123,955	Ord. Stk.	8 1/2	3	6	Nil
	Do. Eastern Extn.	311	4.4.36	2,254	– 44	40	80,638	76,345	+ 4,293	—	—	—	—	—
	Do. Northern Extn.	185	4.4.36	1,622	+ 68	40	56,568	42,516	+ 14,052	—	—	—	—	—
	Do. Western Extn...	211	4.4.36	799	+ 241	40	35,322	31,507	+ 3,815	—	—	—	—	—
	Cordoba Central	1,218	11.4.36	20,980	– 6,100	41	1,149,910	1,159,020	– 9,110	Ord. Inc.	4	1	2 1/2	Nil
	Costa Rica	188	Feb., 1936	14,640	– 562	35	106,919	131,069	– 24,150	Stk.	35	30	36	5 9/16
	Dorada	70	Feb., 1936	12,300	+ 1,300	9	25,600	21,500	+ 4,100	1 Mt. Db.	103 5/8	102 1/2	104 1/2	5 5/8
	Entre Rios	810	11.4.36	7,944	– 1,878	41	442,442	506,683	– 64,241	Ord. Stk.	15	6 1/2	9 1/2	Nil
	Great Western of Brazil ..	1,082	11.4.36	6,200	– 800	15	139,800	150,400	– 10,600	Ord. Sh.	1/2	5/16	1/2	Nil
	International of Cl. Amer.	794	Feb., 1936	$491,759	+ $82,680	9	$993,298	$838,555	+ $154,743	—	—	—	—	—
	Interoceanic of Mexico ..	—	—	—	—	—	—	—	—	1st Pref.	1/2	3/32	1/2	Nil
	La Guaira & Caracas ..	22 3/4	Mar., 1936	4,310	+ 270	13	12,960	10,540	+ 2,420	Stk.	8 1/2	8	8 1/2	Nil
	Leopoldina	1,918	11.4.36	16,569	+ 1,949	15	271,915	263,620	+ 8,295	Ord. Stk.	8 1/2	2 1/2	7	Nil
	Mexican	483	7.4.36	$295,800	+ $76,700	14	$3,561,300	$3,255,200	+ $306,100	,,	1 1/2	1/4	3/4	Nil
	Midland of Uruguay ..	319	Feb., 1936	8,176	+ 2,203	35	56,312	85,088	– 28,776	,,	1 1/2	1 1/2	1 1/2	Nil
	Nitrate	401	31.3.36	8,496	+ 3,869	13	44,465	35,118	+ 9,347	Ord. Sh.	64/–	42/–	2 1/2	Nil
	Paraguay Central	274	11.4.36	$2,581,000	+ $968,000	41	$86,925,000	$44,820,000	+ $42,105,000	Pr. Li. Stk.	80 1/2	60	77	7 15/16
	Peruvian Corporation ..	1,059	Mar., 1936	87,170	+ 29,660	39	703,226	557,156	+ 146,070	Pref.	105 8	67/16	13	Nil
	Salvador	100	4.4.36	¢27,250	+ ¢50	40	¢782,496	¢827,702	– ¢45,206	Pr. Li.Db.	65	61	65	7 11/16
	San Paulo	153 1/2	5.4.36	26,731	+ 2,561	14	400,142	310,286	+ 89,876	Ord. Stk.	80	35	55 1/2	4 1/2
	Taltal	164	Mar., 1936	4,265	+ 87	39	32,750	26,885	+ 5,865	Ord. Sh.	1 11/16	1 1/8	1	10
	United of Havana	1,353	11.4.36	27,497	– 2,520	41	945,879	960,783	– 14,904	Ord. Stk.	3 1/16	1	3	Nil
	Uruguay Northern	73	Feb., 1936	807	+ 246	35	6,367	9,007	– 2,640	Deb. Stk.	4 1/2	2 15/16	4 1/2	Nil
Canada.	Canadian National	23,663	7.4.36	67!,786	+ 41,980	14	8,727,741	8,305,087	+ 422,654	—	—	—	—	—
	Canadian Northern ..	—	—	—	—	—	—	—	— 4 p.c.	Perp. Dbs.	78 8	52 1/2	68	5 7/8
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	103 8	93	102 1/2	3 7/8
	Canadian Pacific	17,245	7.4.36	503,000	+ 48,400	14	6,359,800	5,742,200	+ 617,600	Ord. Stk.	14 1/16	8 3/4	13	Nil
India.†	Assam Bengal	1,329	20.3.36	34,905	+ 100	51	1,226,401	1,385,351	– 158,950	Ord. Stk.	92 1/8	77 1/2	85 1/2	3 1/2
	Barsi Light	202	20.3.36	3,525	+ 863	51	137,985	132,840	+ 5,145	Ord. Sh.	105	77 1/2	73 1/2	6 15/16
	Bengal & North Western ..	2,112	20.3.36	90,978	+ 12,524	51	1,328,466	1,298,958	+ 29,508	Ord. Stk.	301 1/2	291	305 1/2	5 1/4
	Bengal Dooars & Extension	161	10.3.36	2,995	– 491	49	131,776	147,325	– 15,549	,,	127 1/2	122	125 1/2	5 9/16
	Bengal-Nagpur	3,268	29.2.36	179,925	+ 29,020	48	5,887,272	5,465,760	+ 421,512	,,	105	100 5/16	102 1/2	3 7/8
	Bombay, Baroda & Cl. India	3,072	31.3.36	307,950	+ 72,600	52	8,417,100	8,302,800	+ 114,300	,,	115 1/4	110	112 1/2	5 5/16
	Madras & Southern Mahratta	3,230	20.3.36	160,125	+ 10,983	51	5,221,774	5,380,890	– 159,116	,,	128 1/2	113 7/8	115 1/2	7 3/4
	Rohilkund & Kumaon ..	572	20.3.36	18,757	+ 1,121	51	263,817	263,489	+ 328	,,	294	262	299 1/2	5 5/16
	South India	2,531	20.3.36	108,847	– 5,438	51	3,806,622	4,015,961	– 209,339	,,	119 3/4	104 1/4	106 1/2	7 1/16
Various.	Beira-Umtali	204	Jan., 1936	61,199	– 3,320	17	254,392	245,504	+ 8,888	—	—	—	—	—
	Bilbao River & Cantabrian	15	Mar., 1936	1,207	– 610	13	4,677	6,128	– 1,451	—	—	—	—	—
	Egyptian Delta	622	20.3.36	6,218	+ 481	51	244,311	233,987	+ 10,324	Prf. Sh.	2	15/8	1 3/4	5 11/16
	Great Southern of Spain ..	104	4.4.36	961	– 717	14	16,139	26,211	– 10,072	Inc. Deb.	3 1/2	2	3 1/2	Nil
	Kenya & Uganda	1,625	Feb., 1936	245,527	+ 26,405	9	478,026	459,598	+ 18,428	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	48	36	46 1/2 §	7 1/2
	Mashonaland	913	Jan., 1936	97,871	– 23,922	17	410,904	464,048	– 53,144	1 Mg. Db.	104 1/4	100	103 §	4 7/8
	Midland of W. Australia ..	277	Feb., 1936	13,498	+ 2,402	35	111,949	110,221	+ 1,728	Inc. Deb.	98 3/4	93	94 1/2	5 5/16
	Nigerian	1,905	7.3.36	31,650	– 1,176	49	1,807,928	1,888,657	– 80,729	—	—	—	—	—
	Rhodesia	1,538	Jan., 1936	180,459	– 15,308	17	756,445	752,419	+ 4,026	4 p.c. Db.	105 1/2	101	105	3 15/16
	South African	13,250	21.3.36	576,058	+ 35,796	51	29,191,537	26,368,995	+ 2,822,542	—	—	—	—	—
	Victoria	4,728	Dec., 1935	866,995	– 3,320	26	4,826,292	4,751,974	+ 74,318	—	—	—	—	—
	Zafra & Huelva	112	Feb., 1936	10,741	+ 219	9	21,230	21,904	– 674	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

New French Main-Line Railcar Services

THE operation of fast and important main-line trains in France by railcars or oil-engined set trains, which began in 1933 with the Bugatti service from Paris to Trouville, and was subsequently extended to other Bugatti and Renault services, is to receive a further fillip this year and in 1937. On the Nord, the present 63-65 m.p.h. service between Paris, Lille, and Tourcoing, is to be increased from one triple-car oil-engined train a day in each direction to three. The Est, following the super-speed trials between Strasbourg and Paris in November and December last with Bugatti and Renault cars, is to inaugurate in the summer fast railcar trips from Paris to Strasbourg via Nancy, and from Paris to Charleville via Rheims, and also a direct railcar service from Langres and Troyes to Paris. On the Etat a comprehensive scheme for providing a frequent service of railcars over the Paris-Rouen-Le Havre route has been authorised, and for services over longer distances, such as from the French capital to Brittany or La Rochelle, the Renault and Michelin companies are building triple-car trains. With the beginning of the summer timetables on May 15, the P.L.M. will extend the present Menton-Toulon service to Marseilles, and new main-line railcar services will be introduced between Lyons and Paris, Lyons and Besançon, and from Grenoble to Marseilles. On the above date the P.O.-Midi Railway will begin a new cross-country railcar running from Bordeaux to Clermont-Ferrand via Perigeux. Investigations are now being made into the feasibility of running a very fast railcar or oil-engined train from Lille, or possibly one of the Channel ports, to Basle, in order to give a greatly accelerated service between England and Switzerland which would compete with the existing air services. It is not likely that this train will be introduced before 1937.

Railcars for Main Line Haulage

THERE is a decided tendency abroad to use high-power diesel railcars to supplant steam locomotives for main line duties, not by constructing a number of cars and running more frequent services, but by simply substituting the car for the locomotive and running the same rake of carriages to the same, or a slightly accelerated, schedule. For something like a year one of the 550 b.h.p. double-engined Ganz railcars of the Hungarian State Railways has been operating such trains, and we recently had the opportunity of travelling with the service which leaves Subotica (in Jugoslavia) at 6.29 a.m. and runs through to Budapest, 108 miles, in 4 hr. 53 min. inclusive of 21 stops. On this occasion the load was made up of seven passenger cars with a gross trailing load of 180 tonnes. Similar services over shorter distances are to be found in Denmark, the cars employed in that country having an aggregate output of 550 b.h.p. and a normal haulage capacity of 120 tons. Germany, too, favours this type of operation in certain districts, but the motive power units are of slightly less capacity, viz., 400-420 b.h.p., and similar powers are found on the Czechoslovak State Railways, where important express services are hauled by 400 b.h.p. double-bogie diesel railcars. But single-unit cars of much greater output are now being built in various parts of the Continent, notably in France and Poland. The single-engine 500 b.h.p. Renault vehicles are intended more for super-speed solo services, or with one trailer, but several double-engined 600 b.h.p. standard cars with SLM-Winterthur transmission are being built by the Acieries du Nord and will be utilised for train haulage. In Poland five cars of the same power are under construction, and each will be powered by two Saurer 12-cylinder Vee engines. When completed it is intended to use these cars on fast schedules of the order of those now operated by the 300 b.h.p. cars, but two or three trailers will be hauled, and the equivalent of a steam train obtained with a lower operating cost and a somewhat greater overall speed.

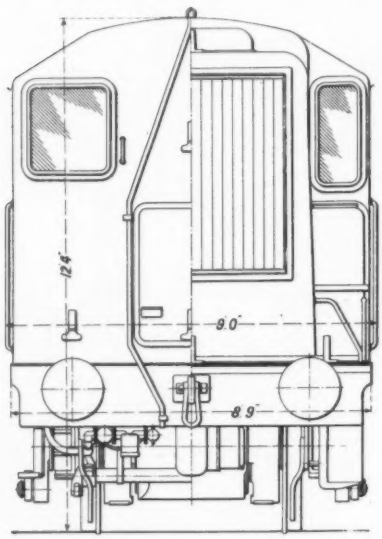
Single Cars for Long Distances

SINGLE-UNIT railcars, as distinct from the double or triple unit trains, are being used to an increasing extent in Central Europe for the operation of reasonably fast services over distances exceeding 100 miles. The well-known Ganz *Arpad* car for example, has been working over the 168·4 miles from Budapest to Vienna on a 56·7 m.p.h. schedule for well over a year past, and, incidentally, has had no failure book against it for some time past. The same type of car operates also on a somewhat slower schedule between Budapest and the south-west end of Lake Balaton, a distance of about 125 miles. In both examples the same car makes the return trip in one day, but does not do it every day in the week, as four cars (including any under repair) are available for the two services, and are shedded at Budapest (Keleti). Two long-distance services are operated with single railcars by the Austrian Federal Railways, and in each case the new 410 b.h.p. diesel railcars (see the issue of this Supplement for February 22, 1935) work in the same link as the Austro-Daimler cars powered by two petrol engines. At the moment, proposals are being made to fit oil engines into the latter vehicles. From Vienna (where the cars are shedded) to Klagenfurt, the 206·5 miles are covered in 338 min. including 12 intermediate stops and the ascent of the Semmering incline. This timing, equivalent to 37 m.p.h., is an improvement of 51 min. on that of the principal steam-hauled express. The longest non-stop run of this car is over the 64 miles from Vienna (Sud) to Semmering, which occupies 109 min. On the Graz service, which follows the Klagenfurt route as far as Bruck, and thus has the ascent of the Semmering in its path, the timing is 207 min. for the 131 miles including three intermediate stops, and the longest non-stop run is over the 51 miles from Vienna to Payerbach-Reichenau in 70 min. An extension of such services is probable in both Austria and Hungary, for the nature of the lines in those countries makes any increase over the present steam-train speeds contingent upon the use of railcars or set trains with a low centre of gravity and a high acceleration. The present railcar services are all well-patronised, but it is probable that many of the long-distance passengers have merely transferred their custom from the slower steam trains running at more inconvenient times. Nevertheless, over intermediate sections these railcar services have done much to recapture traffic from the road, despite the fact that, owing to the limited accommodation, a seat ticket must be obtained beforehand.

MORE L.M.S.R. DIESEL-ELECTRIC SHUNTERS

Another ten 50-ton locomotives for heavy yard service are in course of delivery

AT the end of 1934 the L.M.S.R., following experience with a handful of diesel-mechanical locomotives of 150-180 b.h.p., ordered 20 heavy diesel-electric shunters, ten of 350 b.h.p. from the English Electric Co. Ltd. and ten of 350/400 b.h.p. from Sir W. G. Armstrong-Whitworth & Co. Ltd. Previous experience was available with both types, for the L.M.S.R. owned an Armstrong-Whitworth 250 b.h.p. oil-electric locomotive which had given good service, and the English Electric Company had tried out in intensive service in a number of L.M.S.R. yards a six-wheeled 300 b.h.p. diesel-electric unit built to its own design and specification. This last-named locomotive has been bought by the L.M.S.R. and is now in Crewe works undergoing general overhaul and is being modified to bring it into line with the ten locomotives ordered to the L.M.S. requirements. The Armstrong-Whitworth locomotives were described and illustrated in detail in the issue of the *Diesel Railway Traction Supplement* for March 20.



Longitudinal section and end view of an English Electric 350 b.h.p. shunter of the L.M.S.R.

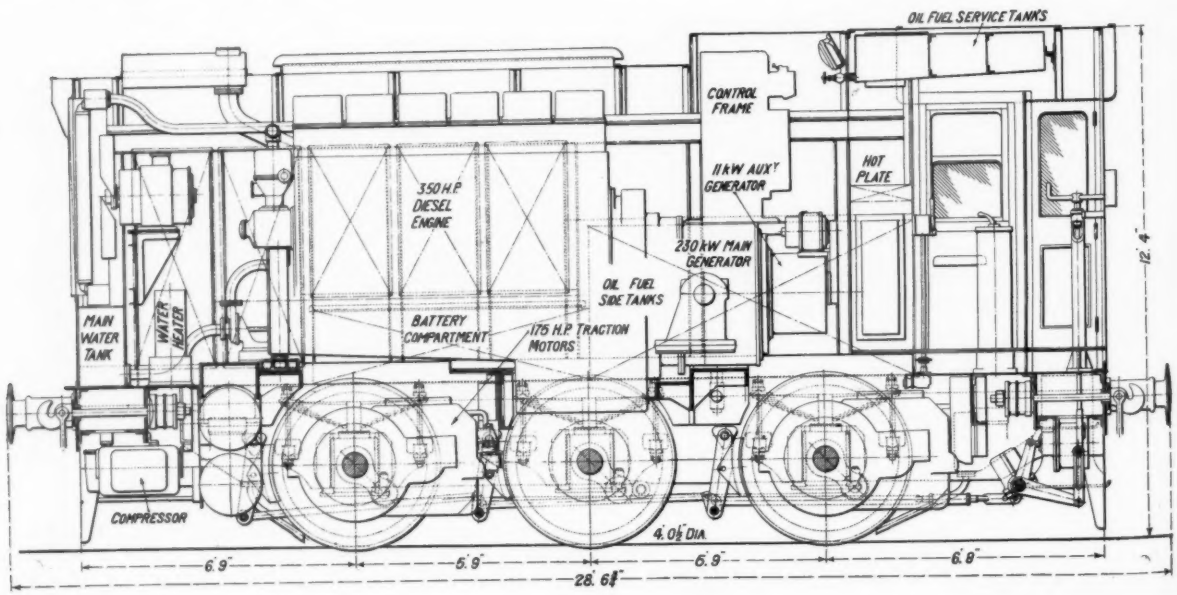
Although the designs of the two makers differ on certain fundamental points, they embody a number of common standard details, such as the radiators, brake cylinders and compressors, brake blocks, and buffing and drawgear. The principal dimensions of the two types are as follow:—

	English Electric	Armstrong-Whitworth
Engine b.h.p. (continuous) ..	350	350
Max. tractive effort, lb.	30,000	30,000
Wheel diam., in.	48½	51
Wheelbase, ft. in.	11–6	14–6
Length over buffers, ft. in... ..	28–6¾	31–4½
Weight in working order, tons ..	51	50
No. of traction motors	2	1
Max. speed, m.p.h.	22	22

All 20 locomotives were built to the specifications and requirements of Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R., to whom, as well as to the makers, we offer our thanks for the facilities placed at our disposal to gather the material for this and the preceding article.

English Electric Design

The feature of the locomotives supplied by the English Electric Co. Ltd. is that two nose-suspended motors drive the end axles and coupling rods are used to transmit the drive to the centre axle. The mechanical portion, built by R. & W. Hawthorn Leslie & Co. Ltd., comprises a normal locomotive frame structure carrying



350 B.H.P. 50-TON ENGLISH-ELECTRIC DIESEL SHUNTING LOCOMOTIVE, L.M.S.R.

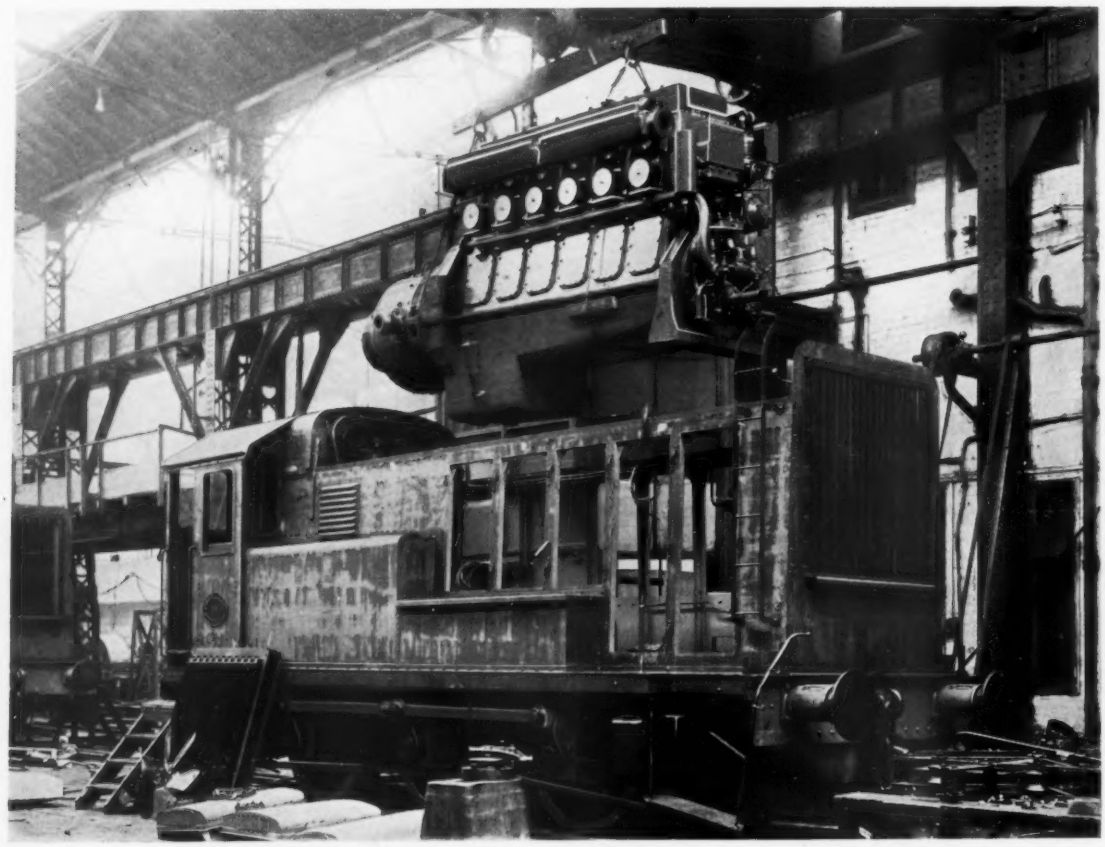
a sheet steel bonnet housing the engine, generator, radiator, and certain auxiliaries, and at one end a full width cab. The frames are outside the wheels and the coupling rods are attached to flycranks pressed on to the ends of the axles. The suspension consists of independent overhung laminated springs for each wheel. Strong vertical cross-stretchers hold the main frames together and carry the engine-generator unit on a three-point system with rubber pads between the locating blocks on the frame and the three main pedestals.

Westinghouse straight air brakes are employed in conjunction with a quick release valve, which was found necessary in order to enable the brakes to be released quickly enough when reversing, owing to the speed at which the power control can be operated. A hand brake is also fitted. The two compressed air cylinders are located beneath the cab, and to give precise control the brakes are applied through a Westinghouse self-lapping driver's brake valve. The air reservoirs are housed between the frames at the front end of the locomotive just behind the motor-driven compressor, which has a capacity of 25 cu. ft. of air per min. Leading and trailing sandboxes of rather small capacity are attached to the frames and the sand is released by hand-operated mechanism. The bonnet and cab structures are partly welded and partly riveted, and the accompanying general arrangement drawing shows the layout of the engine, auxiliaries and control gear within the steel sheeting. At the sides of the bonnet just in front of the cab are two main fuel tanks, each of 200 gal. capacity, and in the cab roof is the service tank with a capacity of 100 gal.; the total of 500 gal. is sufficient for over 140 hr. of normal shunting work. Drain cocks in the main tanks allow the sludge and water to be drawn off. The totally-enclosed cab has a driving position at each side, with the necessary control and brake handles, a folding seat, and an arm rest incorporated in the drop-window frame. The cab is reached by way of footsteps of normal type, but at the front of the locomotive are large steps at each side for shunters to ride upon.

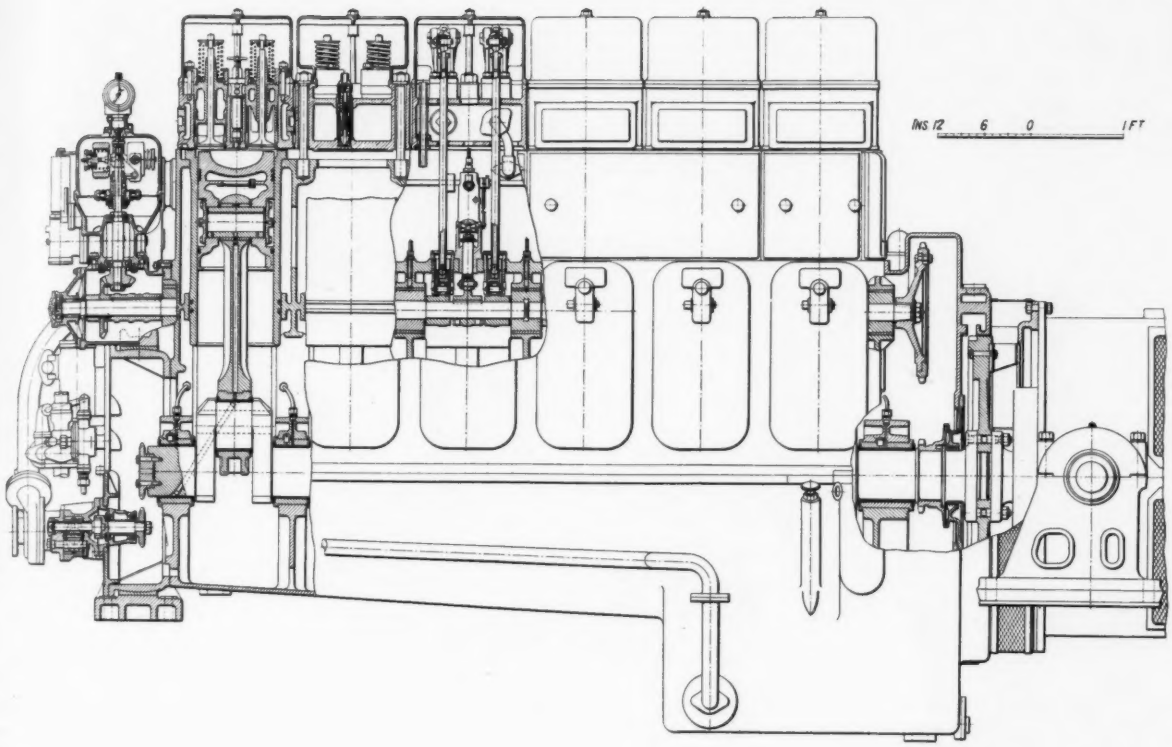
The Engine

Power is supplied by a six-cylinder oil engine built at the Willans works of the English Electric Co. Ltd. at Rugby. The cylinders have a bore of 10 in. and a stroke of 12 in., and at the continuous rating of 350 b.h.p. at 680 r.p.m. the brake m.e.p. is 72 lb. per sq. in. and the piston speed 1,370 ft. per min. Fuel is injected from C.A.V.-Bosch fuel pumps through centrally-placed multi-hole nozzles of the same manufacture at a pressure of about 2,000 lb. per sq. in. The compression pressure is about 450 lb. per sq. in. and the maximum normal explosion pressure 650-700 lb. per sq. in. The idling speed is 350 r.p.m. Subject to a tolerance of 5 per cent., the fuel consumption is guaranteed at 0·39 lb. per b.h.p.hr. at full load and 0·41 lb. at three-quarter load, assuming fuel of 18,250 B.T.U.'s calorific value.

As befits an engine suitable for shunting work, the weight has not been pared down to the limit, and the complete engine-generator set (including the overhung auxiliary generator) weighs 12·35 tons without water or oil, the engine itself scaling something over 60 lb. per b.h.p. Simplicity has been the governing note both in the general

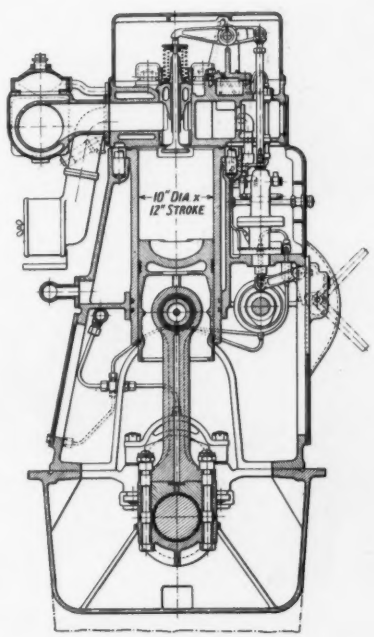


Lowering the engine into the body of one of the English Electric locomotives



Above: Longitudinal section and outside view of English Electric 350 b.h.p. oil engine

Below: Cross-section of same engine



design and in the materials. The crankcase and cylinder block are cast integrally of iron, and the pistons, liners, and cylinder heads are of special cast iron, the cylinder heads being separate. Cast steel has been used for the sump and bedplate which are cast as one piece and extended at one end to form the housing for the main generator fan and to bolt to the generator casing.

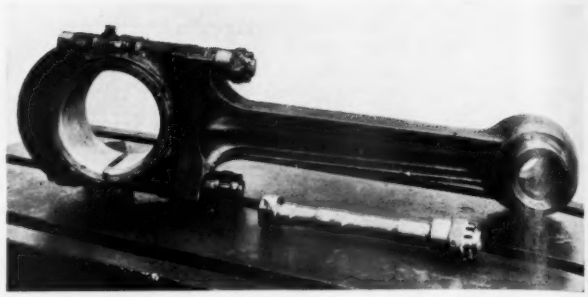
Seven steel-shelled bearings lined with Hoyt's No. 7 white-metal carry the carbon steel one-piece crankshaft. The shaft itself is not hollow bored, but the pins are bored to approximately half their diameter in order to reduce the centrifugal force and to assist in eliminating certain criticals from the normal working range. The camshaft is of 0·5 per cent. carbon steel with the wearing faces of the cams Shorterised. It is housed in the side of the crankcase and carried in plain bearings having a diameter larger than that of the cams so that the whole shaft can be moved in and out without touching the cams. The inlet and exhaust valve cams are in one piece, and are keyed to the shaft, but the fuel valve cams are split and adjustable. The inlet valves (of nickel steel) and the exhaust valves (of alloy steel equivalent to Kayser Ellison No. 695) are driven in the usual way through push rods and rockers and are positively closed by the provision of double concentric springs. The drop-forged I section connecting rods are secured to the piston through fully floating gudgeon pins.

Chains of the Renold type are used for the drive of the fuel pump and cooling water pump. Fuel is taken into the main tanks under air pressure through filling connections beneath the running plate and is led to the service tank, whence it passes through Auto-Klean filters to the injection pumps. The air is drawn into the bonnet through side louvres at the back end, and is passed through Premier Adhesic air filters, one of which is fitted to each cylinder. Cooling of the circulating water and

lubricating oil is effected in Serck sectional radiators mounted on the front of the bonnet. Air is admitted through deflectors outside the radiator and expelled through louvres and through the openings provided in the hinged hood over the engine compartment. The deflectors are hand operated, and can be used to blank off part of the radiator in cold weather, or close the radiator opening when the locomotive is shut down. The fan motor is under thermostatic control; it runs on Hoffmann ball and roller bearings and has a continuous capacity of 4·2 h.p. The water reserve tank is above running plate level and underneath the radiator; it has a capacity of 70 gal. and this with the 20 gal. in the piping and the 60 gal. in the engine gives a total of 150 gal.

The engine is lubricated on the wet-sump principle at a pressure of 10-12 lb. per sq. in. and at a maximum temperature, as shown by the gauges in the cab, of 160/170° F. The lubrication system includes a safety device whereby the engine is shut down should the oil pressure fail. The sump capacity is 75 gal. and this also supplies the oil required for the operation of the governing mechanism. The engine is started electrically by using the main generator as a motor with current supplied from a 40-cell 225 amp. hr. lead acid battery of the D.P.

Piston and liner for 10-in. diameter cylinder



Connecting rod of English Electric oil engine

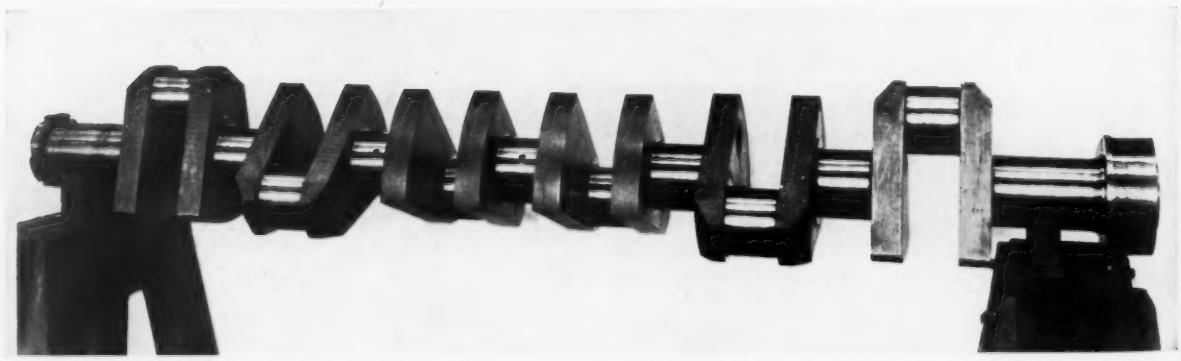
Kathanode type which is charged by the auxiliary generator during normal running.

Transmission

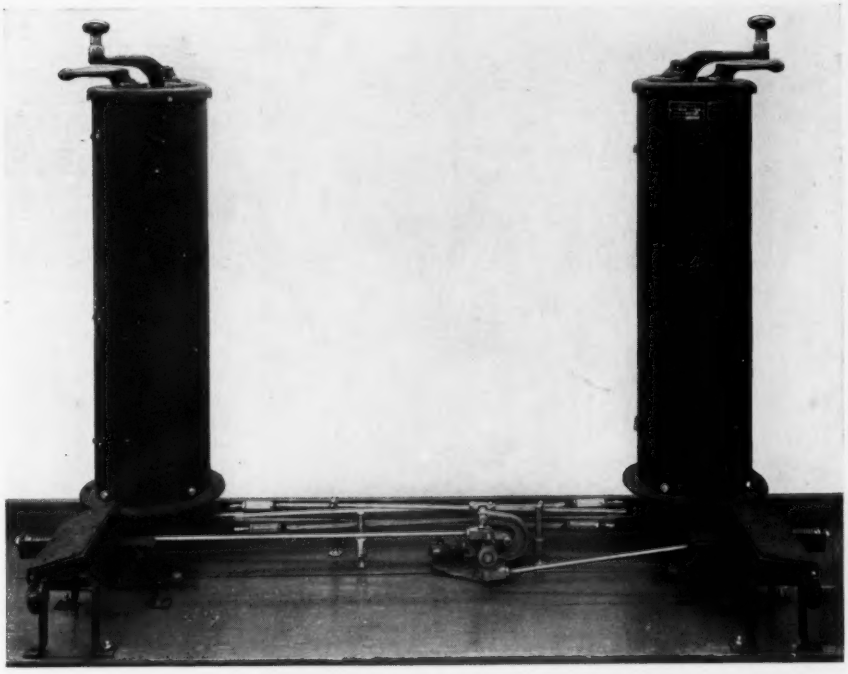
The transmission equipment comprises a self-ventilated main generator of 230 kW. continuous capacity, directly coupled to the engine; an overhung auxiliary generator of 11 kW. capacity which supplies the main generator field circuit, control circuit, lighting circuit, and auxiliary drives, and also serves to charge the battery; two nose-suspended traction motors each with a one hour rating of 180 h.p. at 300 amp. 500 volts. Either traction motor can be cut out of the circuit if a defect should occur, and the remaining motor used for hauling half the normal load. Under such conditions the maximum current in the main generator is not allowed to exceed a peak of 600 amp. compared with 800 amp. for one minute with both motors in operation.

English Electric torque control is embodied in the transmission in order to keep the engine speed and output constant on each notch of the master controller and to prevent the engine being overloaded over the full range of duties. With the application of this system to two motors, working first in series and then in parallel, the high tractive efforts are obtained with a relatively low generator current and high efficiency. In the locomotives under consideration, the speed steps are as given in the accompanying table.

As the master controller is notched up, the speed of the traction motors increases with the engine speed due to successive increases in the voltage of the main generator, but after normal full engine speed has been attained, further acceleration is gained by switching over the grouping of the motors from series to parallel. If the master controller is stepped back from the top notch the parallel



The six-throw one-piece crankshaft as used in the 350 b.h.p. English Electric engine



The master and dummy controllers as installed in the cabs of the English Electric diesel shunting locomotives for the L.M.S.R. The movements of the controller handles are transmitted through the arrangement of rods shown in the illustration. In service these rods are below the floor boards

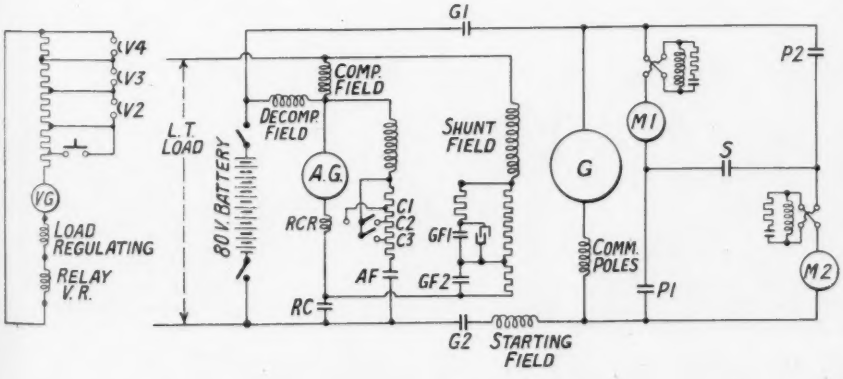
connection of the motors is maintained until the first step is reached.

The English Electric patented torque control system consists fundamentally of a small generator driven off the main generator shaft, whose voltage is very sensitive to speed variations, and which actuates a vibrating relay, controlling the main generator field resistance contactor. Consequently any small variation of the engine speed causes the generator field resistance contactor to vibrate and give an average field strength which at once adjusts the load and therefore the engine speed to its correct value.

Controller Notch	Engine speed r.p.m.	Engine condition	Motor condition
1	350	Idling	—
2	350	Light load	Series.
3	410	Full load torque	,,
4	480	,, ,, ..	,,
5	620	,, ,, ..	,,
6	680	,, ,, (350 b.h.p.)	,,
7	680	,, ,, ..	Parallel.

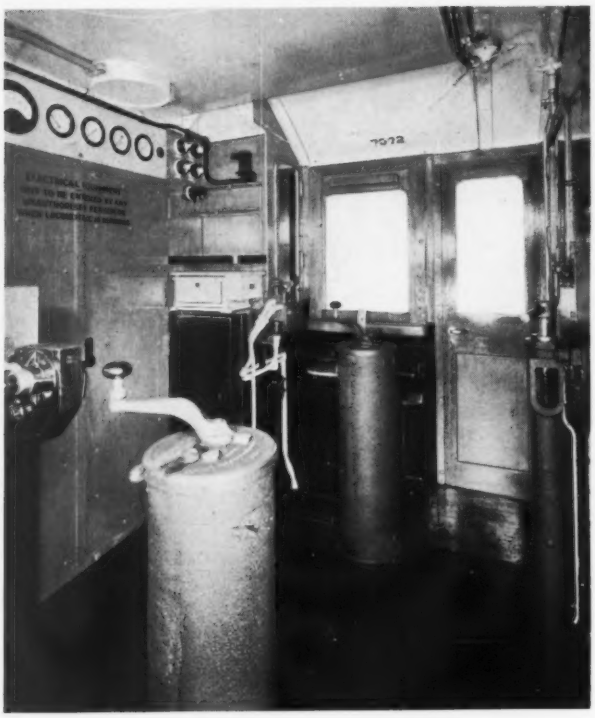
In effect, therefore, the torque control mechanism maintains the engine speed at a constant value, corresponding to full load fuel injection and resists any tendency to overload or underload the engine. For instance, if a cylinder is cut out, the torque control mechanism at once adjusts the load accordingly and restores the speed to its proper value and prevents the remaining cylinders being overloaded. The torque control generator voltage is adjusted by means of resistances so as to be the same on each controller notch and is thus operative at each selected engine speed, keeping the output constant at full torque value.

The engine speed is controlled electro-hydraulically, solenoid-operated valves being used to admit lubricating oil, under pressure of up to 50 lb. per sq. in., and taken from the main system, to control cylinders in which are spring-loaded pistons connected through the springs to a layshaft. When oil is admitted, the piston moves against a stop, thus compressing the spring and externally loading the governor by the desired amount. The layshaft is connected to the fuel pump control rack, and regulation of the injection is effected by the movement of the rack rotating the pump plungers. Any failure in



G	Main generator
AG	Auxiliary generator
VG	Voltage generator
M1, M2	Traction motors
GF1, GF2	Field regulating contactors
V2, V3, V4	Contactors for resistance adjustment
C1, C2, C3	Regulating resistances
G1, G2	Starting contactors
AF	Exciter field contactor
S	Series contactor
P1, P2	Parallel contactors
RC	Battery cut-out contactor
RCR	Battery cut-out relay

Diagram of main circuits of English Electric locomotive



Interior of cab of English Electric shunter for the L.M.S.R.

the lubricating oil system has its effect in the governing system and shuts down the engine. The fuel pumps are operated independently from the control shaft, so that if one pump sticks, the remaining pumps can be closed by the governor.

As may be seen from the general arrangement drawing which accompanies this article, the electrical control apparatus is located above the main generator at the rear end of the bonnet, and is mounted complete on a frame which can be withdrawn *en bloc* through the top of the bonnet. The driver's control of the engine and transmission is limited to the movement of one handle mounted on top of a master controller at one side of the cab. To permit of driving from the other side, a dummy controller, containing the reverser, is installed and the movements of its handle are transferred to the master controller through an arrangement of rods beneath the floor boards. A reversing handle is fitted to both master and dummy controllers, and a foot-operated dead-man device is fitted at each driving position and arranged so that the driver can keep his foot upon it while sitting on the seat. The dead-man apparatus has a time-lag of five seconds, to allow of the driver moving from one side of the cab to the other to observe shunting signals. Further electrical equipment in the cab includes a heater and a breakfast-cooker, and a meter and gauge panel above the control gear cupboard door.

Five of these English Electric locomotives have been delivered, and at the moment are in service at Crewe South Sidings, where they are averaging about 146 locomotive and 138 engine hours a week. The remaining five will be delivered in the course of the next few weeks.

Oil-electric shunting locomotives under erection at the Preston works

REPORT OF THE DIESEL ENGINE USERS ASSOCIATION

FOR the first time the operating costs of railway oil engines finds a place in the annual report on the working cost of heavy-oil engines issued by the Diesel Engine Users Association. The report for the year 1934-35 has just reached us. It contains particulars of the operation of some of the Canadian National Railways diesel railcars, which were furnished by Mr. R. G. Gage, the Chief Electrical Engineer of that system. We think that the inclusion of these figures, and others which may be forthcoming in future years, will not only enhance the value of this annual report, but will widen the scope of an extremely useful association. We are indebted to the D.E.U.A. for permission to publish herewith the figures given by Mr. Gage. In the discussion which followed the presentation of the report on February 28, Mr. T. Hornbuckle, of the L.M.S.R., said that British railways would give the D.E.U.A. information regarding the working costs of their diesel vehicles as this data became available. He also dwelt upon the allocation of repairs and maintenance costs.

Working Costs of Canadian National Railways Diesel Railcars* (from the 1934-35 Report of the D.E.U.A.)

		Nine Diesel-electric railcars with Westinghouse engines — Total and averages		Nine Diesel-electric railcars with Beardmore engines — Total and averages	
		1934	1933	1934	1933
Performance and statistics—					
1. Engine b.h.p., r.p.m. and no. cylinders		350 800 6		300 800 6	
2. Power car miles (total)		429,078	474,447	431,723	368,827
3. Trailer miles (total)		401,130	430,375	416,258	353,986
4. 1,000 ton-miles (total)		48,704	53,621	51,451	44,852
5. Total days scheduled		2,787	2,812	2,603	2,548
6. Motorcar days serviceable in operation		2,037	2,113	1,995·5	1,907·5
7. Days out of service due to equipment (total)		493	474·5	436	527·5
8. Days out of service due to transportation (total)		257	224·5	171·5	113
9. Failures causing cancellation of trip (total)		16	15	19	21
10. Failures causing delay only (total)		15	11	13	27
11. Minutes delayed (total)		520	400	310	1,012
12. Average daily miles in operation		210·6	225	210·8	189
13. Number of men in crew (average)		3	3	3	3
14. Gallons of fuel oil used (total)		157,734	171,077	129,777	111,815
15. Gallons per 1,000 ton-miles (fuel)		3·2	3·2	2·5	2·5
16. Gallons of lubricating oil used (total)		5,010	6,301	6,124	6,623
17. Ratio lubricating oil to fuel oil (by volume)		3%	4%	5%	6%
18. Operating efficiency		80%	82%	82%	78%
19. Total miles to December 31, 1934		1,915,296		2,405,105	
COSTS—					
Maintenance—					
20. Supervision (total)	dollars	2,719·47	2,736·71	1,772·72	1,969·83
21. Car repairs (total)	,,	6,453·55	3,895·07	10,235·47	7,586
22. Motor repairs (total)	,,	51,055·96	40,249·81	42,793·48	61,364·53
23. Total	,,	60,228·98	46,881·59	54,801·67	70,920·36
Running—					
24. Wages of enginemen (total)	,,	25,865·07	28,149·45	25,450·98	22,305·42
25. Wages of trainmen (total)	,,	34,955·08	36,058·38	36,045·06	31,757·74
26. Fuel oil	,,	14,094·08	15,896	12,283·2	10,980·93
27. Lubricating oil (crank-case) (total)	,,	3,802·3	4,778·7	4,539·46	5,140·27
28. Other oils and greases (total)	,,	140·49	150·73	82·55	130·09
29. Other supplies (total)	,,	8,159·06	8,479·69	10,331·69	8,741·93
30. Total	,,	87,016·08	93,512·95	88,732·94	79,056·4
TOTAL COSTS—					
31. Total costs	,,	147,245·06	140,394·54	143,534·61	149,976·76
Specific costs (*cents per motorcar mile*)—					
32. Supervision average		0·63	0·57	0·41	0·53
33. Car repairs average		1·50	0·82	2·37	2·05
34. Motor repairs average		11·90	8·48	9·91	16·63
35. Wages, enginemen, average		6·04	5·93	5·90	6·04
36. Wages, trainmen, average		8·15	7·60	8·34	8·61
37. Fuel oil average		3·28	3·35	2·84	2·97
38. Lubricating oil (crankcase) average		0·89	1·00	1·05	1·40
39. Other oils and greases average		0·03	0·03	0·02	0·03
40. Other supplies average		1·90	1·78	2·40	2·37
41. Total cost average		34·32	29·56	33·24	40·63
42. Total cost per 1,000 ton miles		3·02	2·62	2·74	3·34

* Tons and gallons given in this table are American measures.

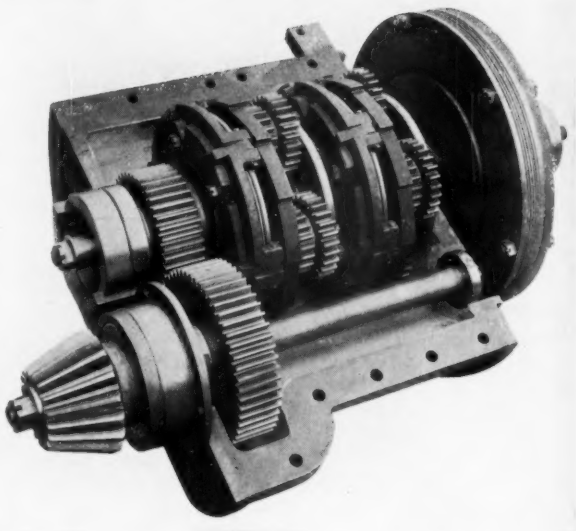
DIESEL SHUNTERS FOR WEST AFRICA

British design embodies automatic gear-changing device

EIGHT narrow-gauge diesel shunting locomotives have been supplied to the New Consolidated Goldfields Limited, West Africa, by F. C. Hibberd & Co. Ltd. Built at that company's Park Royal works, these locomotives are all of the same general design, but two of them are powered by 65 b.h.p. Blackstone oil engines and six by Paxman engines. The locomotives weigh 12 tons and have 24-in. wheels spread over a base of 3 ft. 6 in. The axles are carried in Hibberd boxes and the brakes are of the Lockheed and hand-screw type.

Developing its rated output of 65 b.h.p. at 1,000 r.p.m., the Paxman-Ricardo engine has six cylinders with a bore of $4\frac{3}{8}$ in. and a stroke of $5\frac{7}{8}$ in., and has thus a brake m.e.p. of 88 lb. per sq. in. and a piston speed of 980 ft. per min. The weight is about 2,100 lb. without flywheel. The engine is of cast iron construction, and the cylinder block and upper part of the crankcase are in an integral casting of this material, and have hardened cast iron liners of the dry type forced in. The crankcase is secured to a bedplate of high tensile steel by through bolts, which take the combustion load. The cylinder heads are cast in pairs, of iron, but the passage between the Ricardo air cell and the combustion space is formed of a heat-resisting steel piece, in order to prevent erosion of the cast iron. Fuel is injected by means of a C.A.V.-Bosch fuel pump, gear driven from the chain-driven camshaft, and is passed through C.A.V.-Bosch atomisers. Auto-Klean strainers are used in the lubricating oil circuit. With fuel of 19,000 B.Th.U. calorific value the full load consumption is 0·42 lb. per b.h.p. hr.

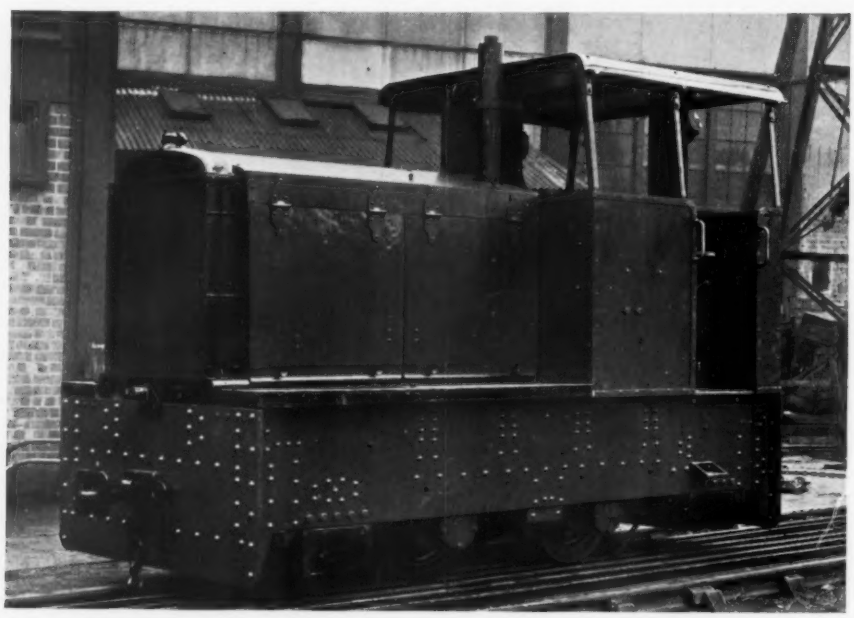
The engine torque is transmitted to the wheels through



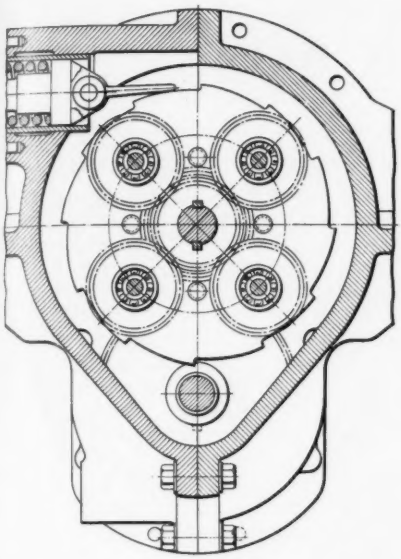
View of Freeborn gearbox and clutch with cover removed

what is now the standard transmission for the Hibberd "Planet" locomotives, viz., the Freeborn automatic gear-changing mechanism. Before being adopted as a standard this transmission was tested out under service conditions for 12 months, and the makers claim that in addition to being fool-proof and of simple design, it has increased efficiency due to the correct gear ratio being instantly available at varying load requirements, and that it dispenses with the manual operation of gears, as there is only a reverse lever and engine throttle handle necessary to control the locomotive movements.

From the engine shaft the torque is taken first through a Freeborn multi-ring clutch and then transmitted to the Freeborn epicyclic gearbox, the chief feature of which is the automatic changing. As may be seen from the illustration depicting the pinion shafts and ratchet wheel, each reduction gear consists of a driving and a driven gear arranged upon a central shaft coupled by pinions carried on a normally free carrier member, also mounted on the central shaft. Each carrier member is adapted to engage the fixed casing when its gearing is in operation, but when the load carried by this gearing is small enough to be dealt with by one less ratio, the carrier member of one ratio disengages the casing and is locked to its driven central

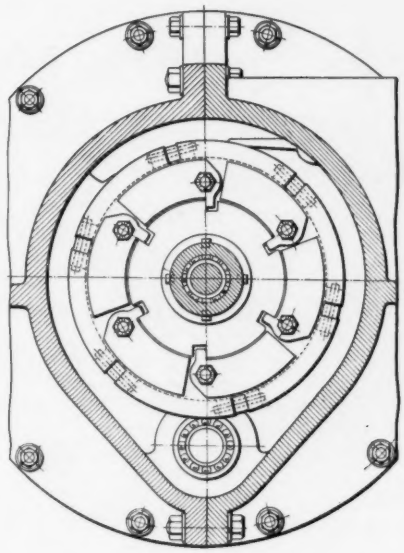


65 b.h.p. diesel-mechanical locomotive for West African goldfields



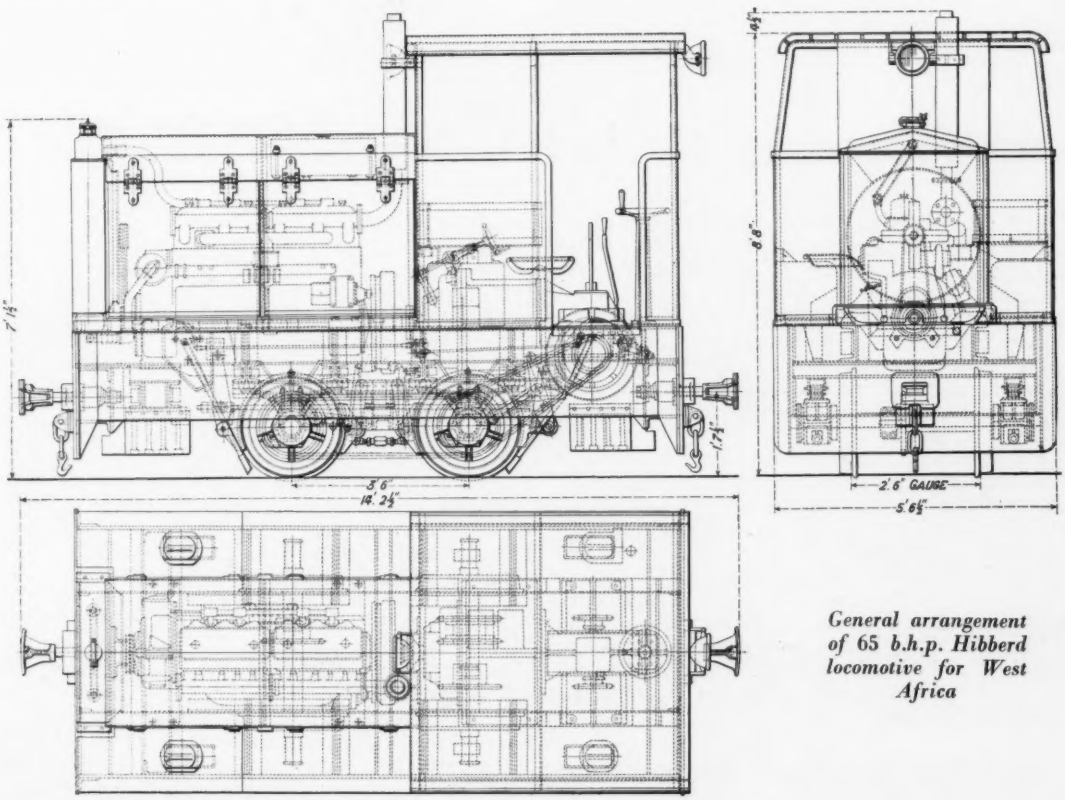
Left : Pinions, shafts and ratchet wheel of Freeborn gearbox as used on the Hibberd "Planet" locomotives

Right : Centrifugal control device to prevent overloading of the Freeborn gearbox



gear, so that this ratio is eliminated from the series. When the last operating ratio is thus eliminated, the whole mechanism rotates bodily and transmits power directly.

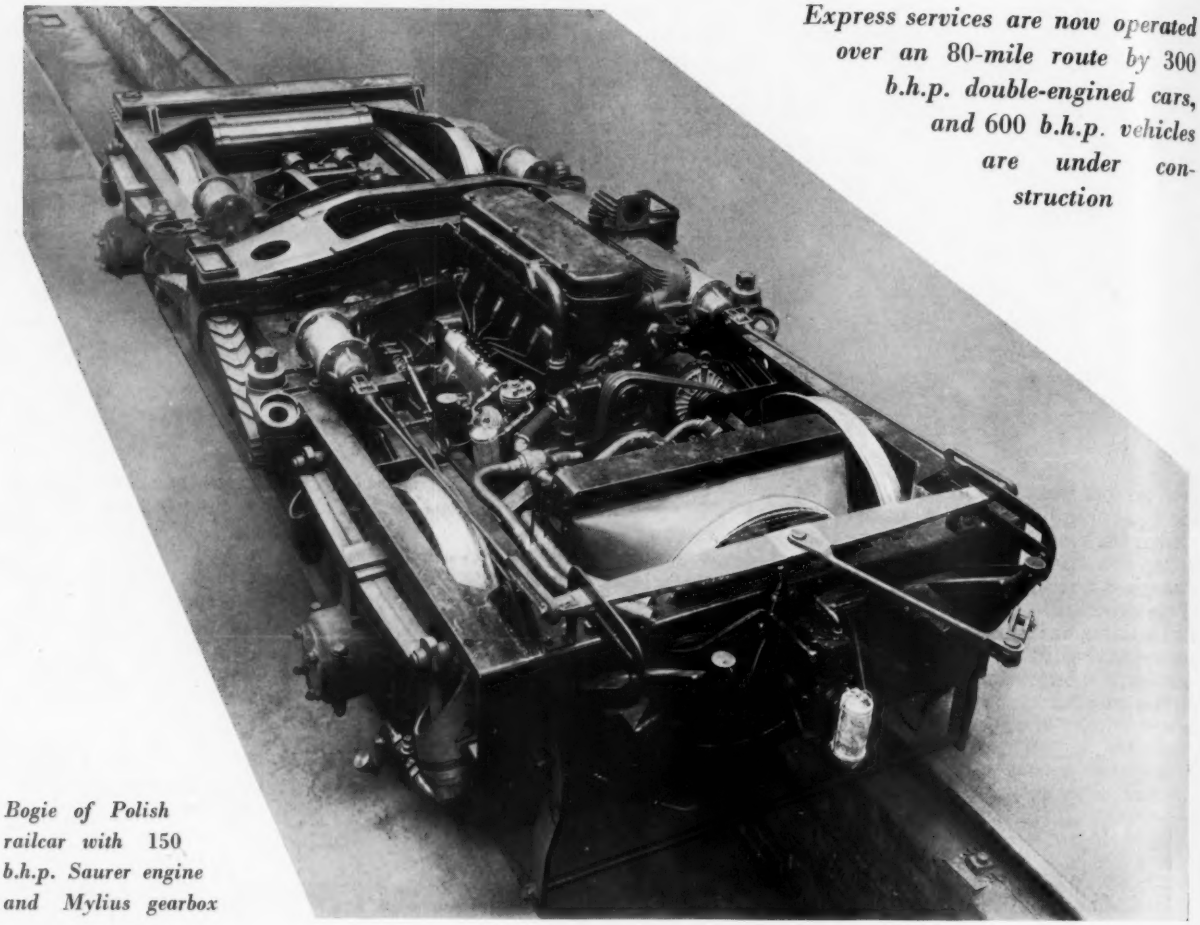
Between each ratio is a load control device which governs the locking and releasing of the carrier member of the driving ratio according to load requirements. This load control, the principle of which is shown in one of the accompanying illustrations, is a centrifugal device which acts as a power safety valve to permit only a given maximum load to be transmitted at a given speed with locked carrier members. When the load is within the capacity of the gear ratio the carrier member is automatically locked, but when any load in excess of the designed figure of the control occurs, the carrier member is released to engage the casing, so that the ratio becomes operative to deal with the excess load. The centrifugal elements of the load control tend to move outwards with greater intensity as speed increases, but are restrained from this movement by the load tending to keep them in. F. C. Hibberd & Co. Ltd. have on order an 82 h.p. locomotive with Freeborn gearbox for the Crossley-Premier Company Limited.



General arrangement of 65 b.h.p. Hibberd locomotive for West Africa

DIESEL RAILCAR PROGRESS IN POLAND

Express services are now operated over an 80-mile route by 300 b.h.p. double-engined cars, and 600 b.h.p. vehicles are under construction



Bogie of Polish railcar with 150 b.h.p. Saurer engine and Mylius gearbox

THE first diesel cars in Poland began to run at the end of 1934, and were described in the issue of this Supplement for November 30 of that year. They comprised a double-bogie standard-gauge car with two 100 b.h.p. Saurer engines and Mylius gearboxes and a narrow-gauge four-wheeled car with one 100 b.h.p. engine and Mylius gears. A second double-bogie car, with one 200 b.h.p. Ebermann engine was then almost completed, and one or two small eight-wheeled cars for narrow-gauge railways.

Since that time the use of diesel railcars has made a distinct advance by the introduction of Ganz and Polish-built cars on fast and slow services, the latest cars being big double-bogie vehicles of 300 b.h.p. which are now operating on fast schedules between Warsaw and Lodz, and will, in the summer, run also between Warsaw and Katowice. There are three services a day in each direction between Warsaw and Lodz, the standard time for the 130 km. (81 miles) being 88 min. These cars have been built by the Polish firms of H. Cegielski S.A. and Lilpop, Rau & Loewenstein, and incorporate Saurer engines and Mylius transmission.

The cars with the Ebermann engine were built by Lilpop, Rau & Loewenstein and were designed for a top speed of 90 km.p.h. (56 m.p.h.). They have a seating capacity of 68 third class passengers within an overall length of 21·18 m. (70 ft.) and on the high tare weight of 34½ tons. The engines and gearbox (the latter also of Ebermann design) are mounted directly on one bogie, and the other bogie is simply a trailer. The gearbox drives a jackshaft in the centre of the bogie frame and the axles are driven through coupling rods, as in the numerous Maybach 175 b.h.p. cars in Germany and elsewhere. The gearbox gives speeds of 9·5, 17, 31, and 56 m.p.h., but certain vehicles have had the ratios altered to give a top speed of 62 m.p.h.

The Ebermann engine runs at 800 r.p.m., and is unusual in being of the six-cylinder Vee type with the cylinders slightly staggered so that the rods of opposite cylinders work side by side on the same crankpins. The included angle between the cylinder banks is 90 deg. The cylinders have a bore and stroke of 180 mm. by 250 mm. (7·1 in. by 9·85 in.) and the engine weighs 21 lb. per b.h.p. including flywheel. The fuel consumption at full load is 190 gr. (0·42 lb.) per b.h.p. and 185 gr. (0·405 lb.) at three-quarter load at 800 r.p.m. The fuel injection is on the direct system from an Ebermann pump through a horizontal orifice in the side of the combustion chamber. The pump itself is not unlike the type used a few years ago by M.A.N. for their high speed engines, and injects

the fuel at a pressure of 4,000-4,500 lb. per sq. in. The order of firing for the six cylinders is 1-2-5-6-3-4.

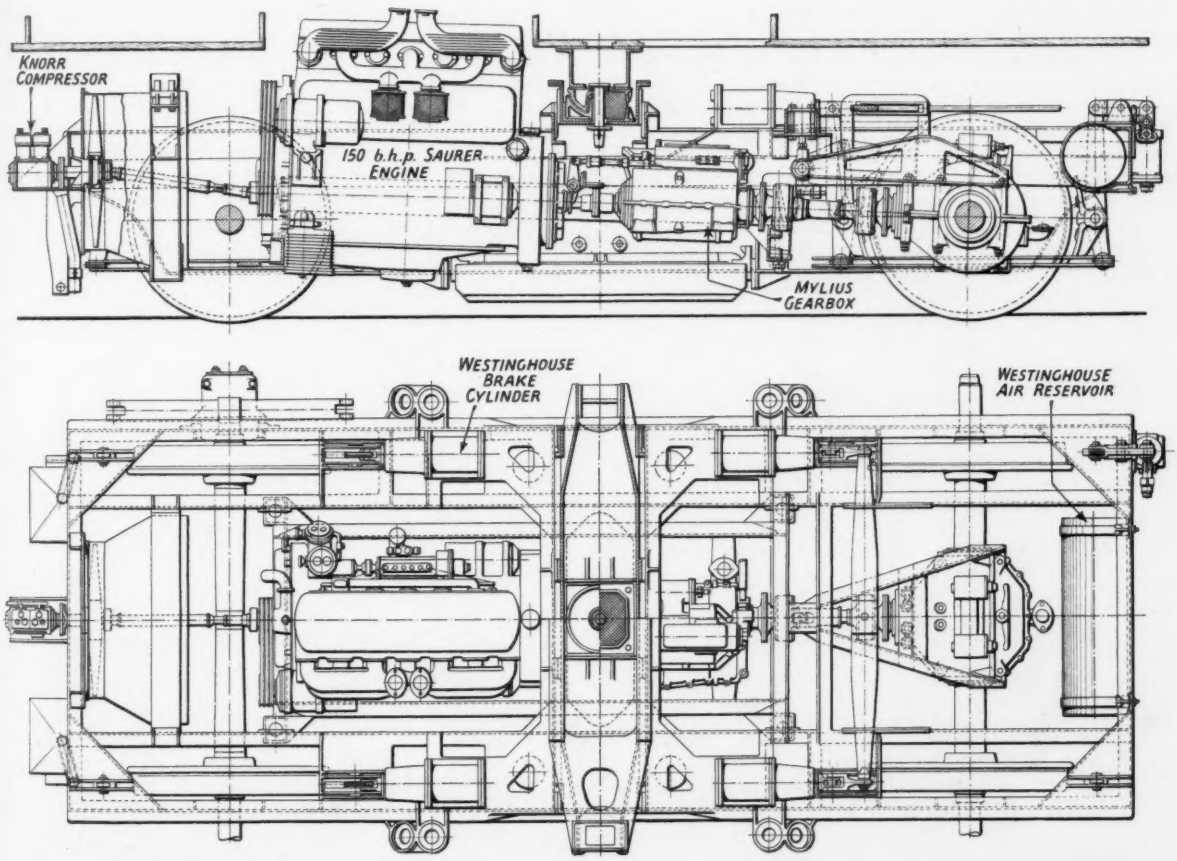
300 b.h.p. Cars

Ten cars of 300 b.h.p. (five built by Cegielski and five by Lilpop, Rau & Loewenstein) are the largest units in Poland. They have bow ends in order to reduce the air resistance, and run up to 80 m.p.h. on the main lines. Despite the provision of two engines totalling 300 b.h.p. and 86 seats in an overall length of 68 ft. 6 in., they weigh six tons less than the Ebermann cars. Each bogie supports a six-cylinder Saurer engine developing 150 b.h.p. at 1,500 r.p.m., which is coupled to a Mylius gearbox giving track speeds of 25, 50, 80 and 130 km.p.h. ($15\frac{1}{2}$, 31, 50, and 80 m.p.h.) at full engine revolutions. The reversing bevels are mounted on the driving axles, that is, the inner axle of each bogie. Both Westinghouse air and electro-magnetic rail brakes are fitted. As with the cars described above, compressed air starting for the engine is embodied.

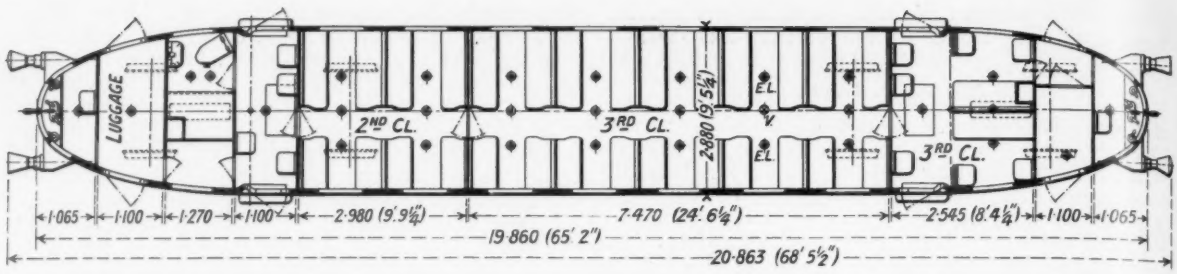
The bogie frame structures are welded up and the accompanying drawing shows the general layout of the bogie and the mounting of the engine and gearbox. The frame plates are 10 mm. (0·395 in.) thick and stiffened by Tee sections 100 mm. by 100 mm. by 11 mm. (3·95 in. by 3·95 in. by 0·43 in.). The frame plates are stayed by Z sections 140 mm. by 65 mm. by 8 mm. by 10 mm. (5·5 in. by 2·55 in. by 0·315 in. by 0·395 in.), and two 140 mm. by 60 mm. (5·5 in. by 2·35 in.) channels run along the side of the frames to stiffen them up. The bogie headstocks are pressings of channel shape 270 mm. by 65 mm. by 10 mm. (10·6 in. by 2·55 in. by 0·395 in.). The bolster is welded up of 10 mm. (0·395 in.) plates and carries a cast iron centre pivot and side bearers of the same material. Both are supported on rubber cushioning.

Separate laminated springs are used for each S.K.F. roller bearing axlebox. They have a length of 1,100 mm. (43·5 in.) and are composed of eight plates 90 mm. by 13 mm. (3·54 in. by 0·51 in.); the unloaded camber is 68 mm. (2·67 in.) and the deflection per ton 11·4 mm. (0·45 in.). The buckles rest on rubber pads on top of the axleboxes. The bolster springs are of the outside longitudinal laminated type, 1,600 mm. (5 ft. 3 in.) long, and composed of 11 plates 120 mm. by 13 mm. (4·74 in. by 0·51 in.) having an unloaded camber of 130 mm. (5·13 in.) and a deflection per ton of 21·4 mm. (0·8 in.). In the case of both bolster and axlebox springs, one of the hangers is arranged vertically and the other on a slope, thus causing a horizontal thrust between the boxes and their guides on one hand and between the bolster and its thrust plates on the other; it is claimed that the resulting friction tends to neutralise the vibrations of the bogie. All the axles are hollow-bored to 50 mm. (1·96 in.) diameter, and carry 910 mm. (35·8 in.) wheels. The engine and gearbox of each bogie are carried on a steel subframe which rests on the bogie at four points, all of which have thick rubber pads.

A good deal of attention has been given to the braking of these cars, and in addition to Westinghouse air and hand screw system, some of the vehicles have electro-



Arrangement of bogie of express railcar, Polish State Railways, showing 150 b.h.p. Saurer oil engine and Mylius five-speed gearbox



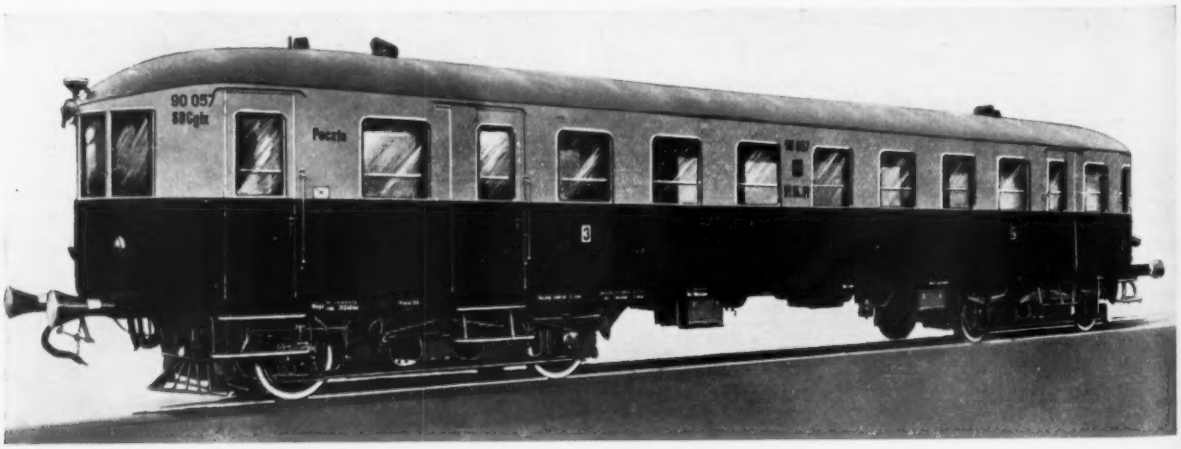
Seating arrangement of standard-gauge express diesel car, Polish State Railways

magnetic track brakes. The air brake is unusual in making use of eight cylinders, one for the clasp rigging on each wheel, and another novel point is that to lessen the weight these cylinders are made of aluminium. Those cars with electro-magnetic braking have two shoes per bogie, one on each side between the wheels, and connected by a steel frame. The shoes are lifted from the rail by compressed air, held by springs, and locked by a pawl. In the event of an emergency application of the driver's brake valve, the locking pawl is released by a solenoid and the shoes attracted to the rails by the current flowing through them. The maximum electro-magnetic braking force with all four shoes in operation is no less than 38 tonnes, the necessary current in this condition being 400 watts per shoe.

The underframe and body are fabricated by welding as an integral structure. The underframe portion is of steel plate 300 mm. (11·8 in.) deep by 6 mm. (0·235 in.) thick with 80 mm. by 40 mm. by 6 mm. (3·14 in. by 1·57 in. by 0·235 in.) angles welded to the top and bottom. The transverse members are of 120 mm. by 50 mm. by 4 mm. (4·75 in. by 1·96 in. by 0·157 in.) channel sections, except for those carrying the bogie pivots; these channels are 180 mm. by 70 mm. by 11 mm. (7·1 in. by 2·75 in. by 0·435 in.). There are further longitudinal and diagonal members, which, together with the transverse members, are connected to the main longitudinals by gussets.

Channel sections, 60 mm. by 30 mm. (2·35 in. by 1·17 in.), form the side members of the body framing; they are welded to the underframe constituents and also to the 60 mm. by 45 mm. by 5 mm. (2·35 in. by 1·77 in. by 0·196 in.) Z bars which form the roof sticks. The waist rail is made up of 30 mm. by 20 mm. by 3 mm. (1·17 in. by 0·79 in. by 0·117 in.) channels, and the cant rails of 50 mm. by 25 mm. by 5 mm. (1·96 in. by 0·98 in. by 0·196 in.) channels. From the underframe to the waist rail the side panels are of 2·5 mm. (0·098 in.) sheet steel, and above that level by 1·5 mm. (0·06 in.) plates which are welded to the side and roof frames. The floor is constructed of 1·25 mm. (0·05 in.) corrugated steel sheets, the concave sections of which are packed with granulated cork and covered by a 10 mm. (0·393 in.) layer of cork over which is laid linoleum. The floor is welded to the underframe. Alfol insulation has been applied to the side panels and the roof, not only on account of its excellent insulating properties but also because of the saving in weight. The Alfol insulation weighs merely 16 kg. (35·5 lb.) per car, whereas it is estimated that a cork insulation would have weighed 170 kg. (375 lb.). The inside of the car is lined with 6 mm. (0·235 in.) birch panels and the ceiling with 4 mm. (0·157 in.) panels.

Both second and third class passengers are carried, 20 of the former and 66 of the latter. Lavatory accommodation is provided and there are postal and baggage compartments, as well as a driving cabin at each end of the vehicle. The seat frames are made of steel tubing, and duralumin has been used for the window frames and parcel racks. The saloons of the car are lit by a double row of 25-watt electric bulbs, and at each end of the car are two plain headlights of 100 watts capacity and one red light. A 150-watt reflector is fitted on the roof at each end to project the light vertically so that the car may be located easily at long range or in fog. Air for ventilation is drawn into a duct between the roof and the ceiling and supplied to the passenger saloons through adjustable ventilators. In each driving position is a handle for engaging one or both engines; a gear-changing lever; a throttle control; a reversing handle; driver's brake valve; gauges for engine



300 b.h.p. diesel-mechanical railcar built by Cegielski for fast services

Driving compartment of one of the double-engine 300 b.h.p. fast railcars of the Polish State Railways

cooling water and lubricating oil temperatures; gauge for lubricating oil pressure; air brake gauges; a Deuta speedometer; and electric switches.

Tests with one of these 300 b.h.p. diesel mechanical cars resulted in a top speed of 140 km.p.h. (87 m.p.h.) being attained on the straight level, and in the 304 km. (188·5 miles) from Poznan to Warsaw being covered in 160 min. On the Cracow-Zakopane line grades of 1 in 40 were surmounted at an average speed of 48-52 km.p.h. (30-32 m.p.h.). Acceleration tests on the straight level gave the following readings:—

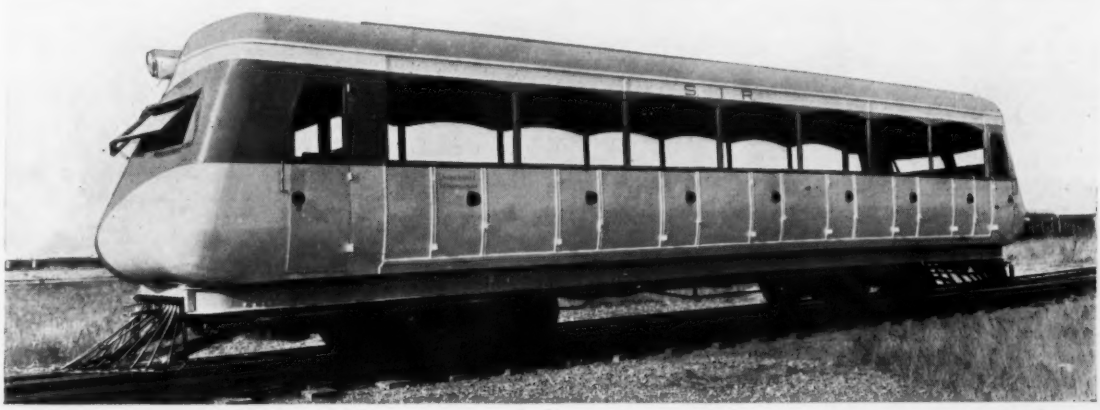
20 km.p.h.	(12·4 m.p.h.)	in	13	sec.
40 ,,	(24·8 ,,)	,,	25	,,
80 ,,	(49·6 ,,)	,,	75	,,
90 ,,	(55·9 ,,)	,,	105	,,
100 ,,	(62·1 ,,)	,,	174	,,

Braking tests, using the Westinghouse air brake only, showed that smooth stops from 100 km.p.h. (62 m.p.h.) could be made in 300 m. (328 yd.) in a time of 21½ sec.

The Polish State Railways, encouraged by the results given by these vehicles, and driven by the relatively heavy operating expenditure of main line trains, have decided to go in for even larger cars and orders have been placed for five cars each having an aggregate output of 600 b.h.p. They will be powered by two of the Saurer 300 b.h.p. 12-cylinder Vee engines illustrated and described in the issue of this Supplement for November 29, 1935. These engines run normally at 1,500 r.p.m. and have cylinders with a bore of 130 mm. and a stroke of 180 mm., and they are unusual among engines of this class in that cast iron is used largely in their construction.

ANOTHER INDIAN RAILWAY ADOPTS DIESEL TRACTION

70-seater petrol-car rebuilt with heavy-oil engine



THE South Indian Railway has just made an interesting conversion by rebuilding one of its three petrol-engined railcars with diesel propulsion. The new engine and transmission have been supplied by Motor Rail Limited, of Bedford (which firm built the Dorman-engined petrol cars), to the specifications and inspection of Messrs. Robert White & Partners, the railway company's consulting engineers.

A Gardner four-cylinder diesel engine developing 64 b.h.p. at 1,600 r.p.m. forms the new power unit and it is coupled to a Dixon-Abbott three-speed gearbox. The body of the original car has been modified by the fitting of new driving compartments and end pieces of more pleasing design, and finishing off the car in aluminium and blue with oxidised copper fittings. All this work was done at the Golden Rock works of the South Indian Railway. The framework of the ends is of light steel sections electrically-welded together; the exterior panels are $\frac{3}{32}$ in. steel plates secured to the framework by countersunk screws, but with the butt seam electrically welded and ground. The inside lining of the driving compartment roof is of teak, and a soundproof partition of Insulwood, with an air space one inch wide, has been provided between the passenger compartment and the engine. This partition has windows in a position corresponding to those of the driver's windows, in order to give the maximum light in the front end of the passenger compartment. At the moment the car is being used in shuttle service on a line with dense traffic, and the saving in fuel cost compared with the petrol car is about 2 annas 7½ pies per mile.

RAILCAR DEVELOPMENTS IN FRANCE

IN a comprehensive review of railcar developments in France, M. Victor Nicolet, Assistant to the Chief Mechanical Engineer of the State Railways, in *Information* traces the history of the railcar from the first experiments with the Renault and Michelin cars in 1931. The crucial moment in the railcar policy came in July, 1933, he says, when the State Railways introduced fast and frequent services with the first Renault bogie cars between Lisieux and Trouville and a high speed service between Paris and Deauville with the 800 b.h.p. Bugatti.

Success in both cases was such that the idea of limiting the use of the railcar to replacing steam trains on branch lines gave way to the broader view of using the new vehicle for almost all kinds of fast traffic, thus leading up to a real revolution in railway working. The railways and constructors then went ahead with confidence in further railcar experiments. It was not to be expected that the trials would result in the rapid adoption of definite types of cars.

But rapid development in recent years is indicated by the fact that the number of railcars of all types in use and on order by the principal railways increased from 32 at the end of 1932 to 374 at the beginning of 1936. During 1935 the total distance run by railcars was 20,000,000 km. (12,400,000 miles). The intensive use made of the already large number of railcars opens up the possibility of effective co-ordination with steam train traffic. Such a co-ordination plan will shortly be tried between Paris and Havre. Slow trains now stopping at numerous stations between Paris and Rouen will be replaced by expresses—running eventually at hourly intervals from St. Lazare—while railcars will assure corresponding shuttle services between the stopping points of the expresses.

M. Nicolet also points out that the railcar must be able (*a*) to maintain speeds of 120 km.p.h. (75 m.p.h.) or more for long periods, (*b*) to start and stop rapidly and to run up steep gradients quickly in order to give a reliable service at average speeds of 80 km.p.h. (50 m.p.h.), and (*c*) to carry a minimum of 80 passengers seated, and a maximum of 150 passengers for fast services on main lines. The railcar must be comfortable, reversible and economical. In their general characteristics, railcars must embody lightness, high-powered motors, high braking power, compact arrangement of mechanical parts, and comfortable accommodation.

Light Construction is Essential Factor

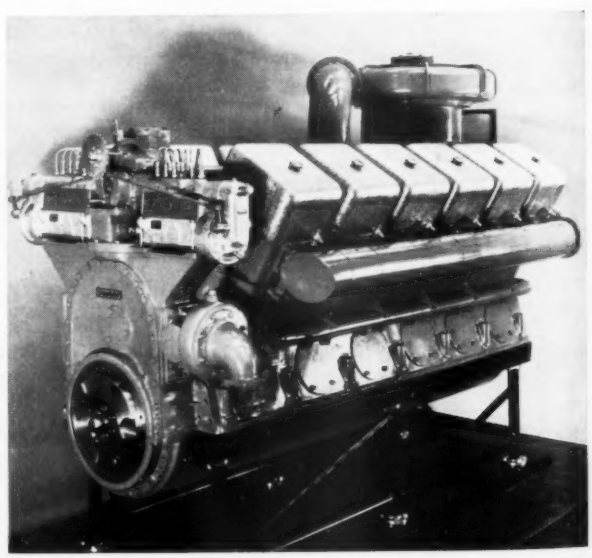
Lightness is the dominant factor in railcar construction. It should be embodied wherever possible, because weight is ruinous for railways, not so much on account of initial capital expenditure as of operating costs and upkeep of the rolling stock and permanent way. According to M. Nicolet, the dead weight hauled per passenger in a fully-occupied fast train is one tonne (2,204 lb.), and in modern railcars it varies from 830 kg. (1,826 lb.) for the triple-car 820 b.h.p. trains of the Nord to 140 kg. (308 lb.) for the 220 b.h.p. Michelin seating 56 passengers.

Almost all French designers of railcar diesel engines have retained the speed of 1,500 r.p.m. used in the 100 b.h.p. diesel engines for lorries, even when they design engines for outputs of 300 b.h.p., and sometimes of 500 b.h.p. In the body framework a great saving of weight is effected by the use of special steels of high resistance, as well as light metals and alloys and tubular constructive elements made of high quality sheet steel, pressed and welded throughout. The dead weight per passenger must be reduced to the minimum in the Michelin owing to the pneumatic tyre, which, although it protects the chassis and body from shocks and permits the use of tubes composed of bent and welded thin sheet steel, has a very limited load capacity.

Experience in recent years has clearly shown that in diesel railcars the power has been too low relative to the weight of the car. The horse-power per ton varies generally from 5 to 8, and this is not enough for quick acceleration and hill-climbing. Constructors are now employing diesel engines of 500 b.h.p. Such powers permit a ratio of 15 b.h.p. per ton, a reasonable figure for general service at an average speed of 80 km.p.h. (50 m.p.h.) to prevent undue strain on the engines and to assure runs equivalent to 100,000 km. (62,100 miles) between overhauls and to avoid working constantly at full capacity.

M. Nicolet also discusses the transmission, and in his opinion mechanical transmission is the best for railcar working. After reviewing the questions of braking and comfortable running, M. Nicolet states that the operating cost of the best French diesel railcars is about 4 fr. per km. or about half the cost of the steam train it replaces; the above figure includes amortisation. For railcars the maximum period of amortisation now in view is ten years, corresponding to total runs of 500,000, 750,000 and 1,000,000 km. (310,000, 465,000, 620,000 miles), according to whether the railcar is used for stopping, semi-fast, or fast services.

M.A.N. Exhibits at Leipzig.—Among the railway oil engine exhibits of the M.A.N. at the Leipzig Fair were two light-weight engines fitted with Büchi superchargers. The first was a six-cylinder-in-line engine which normally develops 480 b.h.p. at 900 r.p.m. continuously, and a maximum of 600 b.h.p. when supercharged. The second engine, illustrated on this page, is the new 12-cylinder Vee 420 b.h.p. engine running at 1,400 r.p.m., which has been fitted with Büchi supercharging equipment to give an output of 600 b.h.p. The unsupercharged engine was illustrated on page 181 of the issue of this Supplement for January 24. The M.A.N. agent in this country is Mr. E. Milton Sellex, 13, Rood Lane, London, E.C.3.



M.A.N. 12-cylinder 420 b.h.p. engine fitted with Büchi supercharger to give an output of 600 b.h.p.